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Highly Sensitive Child Scale for Preschool Age Children: Development, Initial Validation of a New Instrument

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HIGHLY SENSITIVE PRESCHOOL SCALE: DEVELOPMENT, INITIAL VALIDATION OF A NEW INSTRUMENT

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ABSTRACT

The health of the caregiver-child relationship is imperative for positive long-term mental health outcomes in children and is dependent on caregivers' understanding of their child's behaviors. Misunderstanding a child's behaviors prevents caregivers from responding to their child in a nurturing manner, which creates disconnection in the caregiver-child relationship.

Unfortunately, children with sensory processing sensitivity are particularly likely to experience such misunderstanding in their relationships with caregivers.

Sensory processing sensitivity (SPS) is a temperament trait manifesting in stronger neurological and emotional responses to stimuli. To increase understanding of children's needs through proper discovery of SPS, the researcher developed the Highly Sensitive Preschool Scale (HSPS) to identify SPS in preschool-age children.

Specifically, the researcher examined: (a) the factor structure of HSPS with a sample of caregivers with neurotypical preschool age children, (b) the internal consistency reliability of the HSPS, (c) the relationship between the HSPS scores and the PAS (measuring anxiety) and ATEC (measuring autism), (d) the relationship between the HSPS scores and reported demographic data, and (e) the test-retest reliability of the HSPS. Data analysis resulted in a four-factor exploratory HSPS model that accounted for 41.45% of the total variance. Factor 1 (*Empathy*, n = 5) accounted for 17.92% of the variance, Factor 2 (*Response to Stimuli*, n = 3) 11.85%, Factor 3 (*Attention to Detail*, n = 3) 6.6%, and Factor 4 (*Emotional Response*, n = 4) 5.1%.

Finally, the researcher discussed implications of the study including (a) clinicians use of the HSPS to assist in differentiating diagnoses; (b) increased caregiver awareness of behaviors related to SPS, strengthening the caregiver-child relationship, and leading to long-term mental health benefits for their child; and (c) the future need for continuation of replication studies to strengthen the HSPS.

Keywords: Sensory Processing Sensitivity, Highly Sensitive Preschool Scale, preschool mental health, and exploratory factor analysis.

"It is not our differences that divide us.
It's our inability to recognize, accept, and
celebrate those differences."
~ Audre Lorde

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CHAPTER ONE: INTRODUCTION

Researchers indicate the quality of the parent-child relationship is imperative for long-term mental health outcomes in children and is dependent on the caregivers' understanding and acceptance of their child's behaviors (Bratton, Opiola & Dafoe, 2015; Landreth & Bratton, 2020). Many behaviors, especially ones related to temperament are confusing to parents, creating difficulty for parents to express empathy or to provide a nurturing response. For example, 15-30% of children (Arron & Jagiellowicz, 2012; Lionetti et al., 2018; Pluess et al., 2018) have an innate temperament called sensory processing sensitivity (SPS; Aron & Aron, 1997; Aron, 2015; Pluess et al., 2018). This sensitivity is defined as an individual who experiences stronger neurological and emotional responses to surrounding stimuli (Pluess et al., 2018). Children with this sensitivity are likely to exhibit stronger, heightened emotions that may overwhelm parents (Aron, 2015). Parents often view these behaviors as disruptive, over-the-top, or extreme, which can cause difficulties in responding to the child's needs appropriately. To address the experienced difficulties, a tool, such as an assessment, is needed to aid helping professionals (i.e., counselors, play therapists, psychologists, social workers) to first identify the temperament trait and then educate caregivers concerning the strengths and vulnerabilities of sensitivity in children (Smith, Sriken, & Erford, 2019). Through education, helping professionals can increase caregivers' understanding of their child's behaviors, positively impacting the child's mental well-being through relationship (Opiola & Bratton, 2018).

Theoretical Foundation

When a child perceives "felt safety" (Qualls & Purvis, 2020) from primary caregivers, the child can develop a secure relationship and experience increased emotional health and overall well-being (Guerney, 1964; Landreth & Bratton, 2020; VanFleet, 2013). The "felt safety," also known as experiencing being *seen* by the caregiver, allows the child's brain to further integrate its many facets (i.e., left brain, right brain), resulting in increased self-regulation, decision-making abilities, and an experienced sense of security (Siegel & Bryson, 2019). Siegel and Bryson (2019) discussed a child developing security through the four Ss: being safe, seen, soothed, and secure. When caregiver supports their child by seeing their child for who they are, recognizing their needs, and helping to sooth the child, then the child can feel secure. Through a secure relationship, caregivers can then assist their child through focused support, attention, and/or resources for optimal growth and development (Siegel & Bryson, 2019). Specifically, increased attunement to their child's needs strengthens the parent-child relationship as the caregiver becomes more empathic to their child's emotional needs (Bratton, Opiola & Dafoe, 2015; Guerney, 2000; Landreth & Bratton, 2020). Previous researchers noted that when parents understand their children better, they tend to be more developmentally responsive to their child's behaviors, thoughts, and feelings. The development of a scale to measure SPS in preschool age children (3-5 years old) allows helping professionals to aid caregivers in identification of the temperament trait in hopes to better understand their child.

Additionally, researchers studying the impact of Child-Parent Relationship Therapy (CPRT) found children experienced increased self-concept, emotional regulation, and cognitive functioning, secondary to increased parental understanding and empathy (Landreth & Lobaugh, 1998; Opiola and Bratton, 2018). Once caregivers comprehend the purpose behind their child's behaviors, they can help their child to feel *seen* and develop a sense of *felt security,* which tends to lead to a decrease in problematic behaviors (Qualls & Purvis, 2020). Likewise, as caregivers begin to see their child as an individual and understand the purpose of the child's behaviors, stress decreases within the parent-child relationship and empathy increases (Landreth & Bratton, 2020). Findings within CPRT research underscore the importance for helping professionals to first identify the SPS trait and then educate caregivers of the trait in their child. Furthermore, highlighting the need for caregivers to be aware of SPS and how it manifests behaviorally in their child, supports the development of the Highly Sensitive Preschool Scale (HSPS).

Sensory Processing Sensitivity

Researchers have found that approximately 15-30% of children (Arron & Jagiellowicz, 2012; Lionetti et al., 2018; Pluess et al., 2018) have an innate temperament called sensory processing sensitivity (SPS; Aron & Aron, 1997; Aron, 2015; Pluess et al., 2018). Individuals with SPS, regardless of where they are on the continuum of introversion/extroversion, are born with a heighten sensitivity to their surroundings, compared to the general population (Aron, 2015; Aron et al., 2012; Pluess et al., 2018). The experienced heightened sensitivity includes stronger neurological and emotional responses to surrounding and experienced stimuli (Pluess et al., 2018). To assist helping professionals and caregivers in their understanding of this sensitivity, Aron (2020) developed the acronym D.O.E.S. **D** stands for depth of processing, which encompasses, but is not limited to, the depth of questions asked by a child, presence of a clever sense of humor, difficulty in making decisions, and the presence of both high emotional reactivity and empathy. **O** stands for easily overstimulated, which encompasses a child taking in and noticing *all* subtle or minuet aspects of their surroundings, leading to overstimulation and exhaustion. A child that is easily overstimulated has extreme responses to pain or change, frequently experiences meltdowns, and has difficulty falling and staying asleep. Next, **E** stands for emotional reactivity and empathy which comprises, but is not limited to, noticing when others are in distress, feeling deeply, which leads a child to cry often, and responding adversely to doing anything incorrectly. Finally, **S** stands for sensitive to subtle stimuli, which can include, the ability to notice slight changes in appearance of people, places, and things, being aware of communication styles including a glare, sigh, or tone of voice, and to notice slight changes in smells (Aron, 2020). Children with this sensitivity are more in tuned to what adults (i.e., caregivers, coaches, teachers) want or expect from them, increasing their success in various activities (Aron, 2015). Yet, this sensitivity also increases feelings of being overwhelmed from the enhanced attunement to others.

Despite being aware of the presence of SPS, helping professionals hold differing views regarding the impact of SPS on everyday functioning. Some helping professionals view children with SPS as disproportionately emotional (Aron, 2015). Aron (2020) reported that many children tend to view themselves as being *flawed*, a feeling that has evolved due to constantly receiving critiques that their responses to the environment are abnormal. Conversely, other helping professionals view SPS from a strength-based perspective, as an innate part of temperament that allows individuals to have deeper, emotional experiences while working to understand their environment (Aron, 2015; Smith, Sriken, & Erford, 2019). Identified behaviors, associated with SPS, clearly assist in understanding children's daily life experiences as well as the purpose behind their behaviors. Furthermore, without the established knowledge concerning SPS, helping professionals interacting with these children may misunderstand them and consider their behaviors *flawed*.

Previous researchers have studied varying aspects of sensitivity including (a) neurasthenia (Beard, 1880), (b) the sensitivity hyperactive emotional syndrome (Jaspers, 1913/1949), (c) introversion (Jung, 1921/1961), (d) sensory processing sensitivity (Aron & Aron, 1997), and (e) environmental sensitivity (Pluess, 2015). Most recently, Aron (2020) described SPS within individuals as experiencing greater sensitivity, depth of processing, and emotional reactivity to stimuli due to a highly reactive nervous system. To support the established theories surrounding SPS, Aron and Aron (1997) developed the first instrument to identify the trait.

Instrumentation

Starting in 1997, Aron and Aron developed the Highly Sensitive Person Scale (HSPS) to identify the temperament trait in adults, primarily using college age students to conduct factor analysis and psychometric validation of the data. Through their research across seven studies, the researchers established that a unidimensional model best fit the data (Aron & Aron, 1997). Using Aron and Aron's (1997) foundational research, Pluess and colleagues (2018) studied sensitivity in individuals ages 8-19 years old, modifying the label of sensitivity as an environmental sensitivity. The researchers defined environmental sensitivity as the depth to which a child reacts and responds to the environmental stimuli. Pluess (2015) emphasized environmental sensitivity as developmental outcomes are dependent upon the child's ability to understand and process their environment (Pluess et al., 2018). Furthermore, Pluess and colleagues (2018) determined that a three-factor model best fit the data: (a) ease of excitation [EOE; i.e., ease of overstimulation in response to both internal and external demands], (b) aesthetic sensitivity [AES; i.e., appreciation for and/or the ability to be moved/inspired by the arts], and (c) low sensitivity threshold [LST; i.e., unpleasant arousal to external stimuli such as loud noises].

Additional Models of HSPS. While Aron and Aron (1997) provided evidence for the unidimensional factor model, Smolewska and colleagues (2006) revealed several limitations, stating that Aron and Aron (1997) had weak statistical support for the unidimensional model with their sample population. Specifically, Smolewska and colleagues (2006) found: (a) weak factor loadings and (b) small sample sizes ($n < 200$) represented across each of Aron and Aron's (1997) seven studies (Comrey & Lee, 1992; Tabachnick & Fidell, 2013). To address these limitations, subsequent scholars revised the HSPS to consider how data might better fit differing SPS models including: (a) a two-factor model (negative emotionality [NE] and orienting sensitivity [OS], Evans & Rothbart, 2008; (b) a three-factor model (ease of excitation [EOE], aesthetic sensitivity [AES], and low sensitivity threshold [LST], Smolewska, McCabe, & Woody, 2006; Sobocko & Zelenski, 2015); and (c) a four-factor model (general sensitivity/overstimulation, adverse reactions to strong sensitivity, psychological fine discrimination, and controlled harm avoidance; Meyer, Ajchenbrenner, & Bowles, 2005). Each model is comprised of factors to determine how each of the 27 items on the HSPS contributes to the overall SPS trait (Smith, Sriken, & Erford, 2019).

In summary, researchers have designed instrumentation measuring sensitivity for children as young as eight years of age through adulthood, leaving a significant gap in identification of SPS in young children. To assist in addressing the gaps in identification for preschool age children, the researcher will develop an instrument for helping professionals to use to identify the trait who in turn can work with caregivers to develop an increased understanding of their child's behaviors. The current researcher will consider all possible models of SPS when conducting exploratory factor analyses on the developed instrument for SPS in preschool children.

Sensory Processing Sensitivity in Preschoolers

During the past decade, researchers have challenged the idea that young children are not impacted by their environment (Pluess et al., 2018; Rapee, Kennedy, Ingram, Edwards, & Sweeney, 2005). Not only have researchers shown that young children are impacted by traumatic events, but that children under the age of five are at the highest risk for both presence and chronicity of mental health challenges in adulthood (Rapee, Kennedy, Ingram, Edwards, & Sweeney, 2005). With preschool age as the most vulnerable period for development, it is critical for helping professionals to understand children's cognitive processes and emotional development at all stages (Miller, 2020, Porges, 2009, Siegel 2012). The identified vulnerabilities underscore the importance of identifying SPS in preschool age children to minimize mental health challenges in adulthood. More specifically, the presence and chronicity of mental health symptomology in adulthood can occur secondary to the development of anxious symptomology in young children, leading to isolation, decreased social skills, and the development of unhealthy coping mechanisms (Rapee, Kennedy, Ingram, Edwards, & Sweeney, 2005). To better understand what is occurring innately for children with SPS, the current researcher will develop an instrument to identify the trait in preschool age children.

SPS and The Parent-Child Relationship

Researchers have considered other variables related to the parent-child relationship when considering the importance of supporting children with SPS. Specifically, researchers have found that parenting behaviors, such as hostility and rejection predict the presence of the child's internalizing behaviors (Ryan & Ollendick, 2018; Otto et al., 2016; Yap and Jorm, 2015) and externalizing behaviors (Browne et al., 2010; Gershoff et al., 2010; Pinquart, 2017).

Additionally, researchers found the presence of the sensitivity trait, described as fearfulness and shyness, disproportionately impacted developed internalized and externalized behaviors (Karreman et al., 2010; Leve et al., 2005; Ryan & Ollendick, 2018). Wherein children with the sensitivity trait experienced increased secondary impacts (i.e., mental health symptomologies) compared with those children without the temperament trait. Based on the findings, the current researcher hypothesizes that the increased parental negativity increases the likelihood of experiencing rejection or lack of safety within the parent-child relationship for children with SPS, leading to an increase of both internalizing and externalizing behaviors. Based on the findings, the current researcher hypothesizes that when caregivers express disappointment or respond through hostile parenting, children with SPS are likely to feel rejected and unsafe to express their experiences. The experienced rejection could lead to an increase of both internalizing and externalizing behaviors, resulting in difficulties in a child's social, academic, and emotional functioning (Siegel & Bryson, 2019).

Further, researchers examined the moderating effect of a child's temperament on the associations of parenting and problem behaviors (Barnette & Scaramella, 2015). Barnette and Scaramella's (2015) analysis highlighted the impact that the presence of temperament sensitivity can both support the parent-child relationship and challenge the parent-child relationship. When a parent was responsive and supportive, the child thrived by exhibiting fewer problem behaviors. Conversely, when the caregiver engaged with the child with an absence of support, their sensitivity to the environment was heightened, resulting in an increase in problem behaviors. Within the study, the researchers considered children with various temperaments; therefore, the current researcher hypothesized that increased sensitivity to others and their environment heighten negative effects for children with SPS.

Finally, Leve and colleagues (2005) found children who possessed temperament characteristics of shyness and fear as preschoolers and received low nurturance (i.e., harsh discipline for boys, lack of responsiveness for girls), experienced long-term mental health challenges. Leve and colleagues (2005) found that these individuals were more likely to develop internalizing behaviors by the time they were 17 years of age (Leve et al., 2005). The researchers' findings emphasized the importance of increasing caregivers' awareness of their child's SPS at a young age and support of their child's long-term mental health through developed empathy and understanding. Overall, the data supports that identifying SPS in children, starting in early childhood (i.e., preschool), is critical for caregivers to acknowledge temperaments as innate and to use that information to tailor their presence with their child to support their long-term mental health (Ryan & Ollendick, 2018). Furthermore, the researchers' findings emphasize the importance of identifying the trait during a child's early stages of development and support the need to develop an instrument for helping professionals to assist caregivers in their recognition and support of their child with sensitivity.

Overlapping Mental Health Symptomology

Helping professionals are likely to misdiagnose the SPS temperament trait due to the overlap between temperament trait behaviors in children and some mental health symptomologies such as anxiety and autism spectrum disorder (ASD; Aron, 2015). Smolewska and colleagues (2006) identified correlations between mental health symptomology and two subscales of the HSPS and HSCS: Low Sensory Threshold and Ease of Excitation. Additionally, researchers have found correlations related to SPS and mental health symptomology and/or diagnoses including self-perceived stress (Benham, 2006), anxiety, and depression (Bakker &

Moulding, 2012; Liss et al., 2008), and avoidant personality disorder (Meyer & Carver, 2000). Researchers have tied the overlap in symptomology to misdiagnosis (Aron, 2015; Sangster et al., 2014). Further, the researchers have been able to determine that while some overlap exist in observed or reported behaviors, mental health instruments do not assess nor differentiate from sensory processing sensitivity (Liss et al., 2008; Meyer et al., 2005; Smolewska et al., 2006). From these findings, the current researcher used specific scales (i.e., *Preschool Anxiety Scale* [PAS]; Spence, Rapee, McDonald, & Ingram, 2001), and *Autism Treatment Evaluation Checklist* [ATEC]; Rimland & Edelson, 1999) that measure similar behaviors as the Highly Sensitive Scale for Preschoolers to assess for both discriminant and convergent validity.

Assumptions

The researcher made the following assumptions from findings established in the literature concerning SPS: (a) SPS is an innate temperament trait; and therefore the trait cannot be a product of a child's environment (Acevedo et al., 2014; Aron & Jagiellowicz, 2012), (b) SPS is found in about 15-30% of the population (Arron & Jagiellowicz, 2012; Lionetti et al., 2018; Pluess et al., 2018), and (c) SPS can be identified through observations of children's behaviors (Boterberg & Warreyn, 2016; Pluess et al., 2018). Finally, the researcher assumed the presence of differential susceptibility, wherein children with the SPS trait tend to respond to their environment differently, to a greater extent than the general population, based on their perceptions of their environments (Bakermans-Kranenburg & van IJzendoorn, 2011; Caspi et al, 2002, 2003; Kochanska et al., 2011). For instance, children, who perceive their environment as nurturing, respond to their environments more positively than the general population; whereas children, who lack support within their environments, are more likely to respond to their environment more negatively than the general population (i.e., increased emotional upset; Aron et al., 2005; Belsky et al., 2009; Pluess & Belsky, 2013).

Statement of the Problem

Helping professionals' inability to recognize sensory processing sensitivity (SPS) in children limits their ability to support caregivers' understanding of their child's behaviors. When caregivers seek out help for behaviors that they deem problematic, helping professionals may overlook the presence of SPS. Therefore, caregivers are likely to respond to behaviors related to sensitivity as problematic, decreasing their empathy and responsiveness towards their child (Landreth & Bratton, 2020). This disconnection can negatively impact their child's overall well-being. When helping professionals identify and subsequently educate parents about their child's behaviors pertaining to the presence of SPS, the parent-child relationship can be or may be strengthened through increased empathy and understanding of seemingly problematic behaviors (Browne et al., 2010; Otto et al., 2016; Yap & Jorm, 2015). Some scholars view SPS as an innate temperament trait, impacting overall awareness of one's environment (Aron, 2015; Aron, 2020; Pluess et al., 2018). While children's heightened awareness is innate, some helping professionals misinterpret these responses as acquired, negative, and dysfunctional (Aaron, 2015). Current assessments exist to identify SPS in children as young as 8 years old. However, researchers have not yet created an instrument for younger children. Furthermore, researchers have found that development in preschool age children (3-5 years old) is both critical and formative wherein emotional wellness predicts mental health wellness throughout the child's life (Rapee, Kennedy, Ingram, Edwards, & Sweeney, 2005). Considering the developmental needs of preschool age children with SPS, the researcher created an instrument to identify the presence of the temperament trait based on caregiver report within the general population of children ages 3-5 years. More specifically, based on the inconclusive factor structure of similar scales of sensitivity (Montoya-Peréz et al., 2019; Smith, Sriken, & Erford, 2019), the researcher was unable to predetermine the number of factors on the HSPS. Therefore, the researcher conducted an exploratory factor analysis (EFA) to construct the factor structure of the instrument.

Purpose and Research Questions

The purpose of this research study was to design an instrument to measure sensory processing sensitivity in young children. The specific research questions that the researcher investigated included the following:

Research Question 1

What is the factor structure of the items on the HSPS with a sample of children ages 3-5 years-old?

Research Question 2

What is the internal consistency reliability of the HSPS with a sample of preschool age children?

Research Question 3

What is the relationship between HSPS scores and PAS-R and ATEC scores with a sample of helping professionals (examining the convergent and discriminant validity of the HSPS)?

Research Question 4

What are the relationships between HSPS scores and reported demographic data?

Research Question 5

What is the test-retest reliability of the HSPS with a sample of children ages 3-5 years-old?

Research Design

The researcher conducted an instrument development and validation study to identify caregiver perception of sensory processing sensitivity (SPS) in their preschool age child (Demitrov, 2012; DeVellis, 2017). The researcher used a correlational research design to examine psychometric properties of SPS (as measured by *Highly Sensitive Child Scale for Preschoolers* [HSPS]), analyzing both the relationships between items on the HSPS and other instruments (Demitrov, 2012; DeVellis, 2017). Finally, to develop the instrument, the researcher implemented stringent procedures for instrument development as outlined by Dimitrov (2012) and DeVellis (2012). Steps for instrument development included: (a) determining how the highly sensitive trait will be measured, (b) creating items for the scales based off of previous scales and established literature on the highly sensitive trait in preschool children, (c) selecting a form of scale measurement, (d) reviewing scale items using a panel of experts in the field of child development and child counseling, (e) considering inclusion of validation items, (f) administering the agreed upon items to a sample population, (g) evaluating the items, using an exploratory factor analysis (EFA), and (h) reevaluating item use within the scale based on the statistical analysis of the EFA.

Step 1: Determine the Characteristics of Sensory Processing Sensitivity

When developing an instrument to measure SPS in preschool age children (3-5 years old), the researcher first clarified the characteristics of SPS (DeVellis, 2017). To address the need of clarity, the researcher reviewed current research pertaining to the trait, including but not limited to (a) theoretical explanations of the trait, (b) how researchers observe the trait in others, and (c) how the trait differs from other personality traits currently measured in individuals

(DeVellis, 2017). Furthermore, by providing clarity, the researcher illuminated the purpose of the HSPS (Dimitrov, 2012).

Step 2: Create Items for Scale

The researcher created items based on the identified purpose for the scale (DeVellis, 2017). Additionally, the researcher developed an exhaustive list of items that reflect identified sensitivity in children. In creating the items, the researcher was mindful in developing a pool of items considering the following (a) some items reflected similar constructs (Lionetti et al., 2018), (b) some items were repetitious or redundant to accurately capture the construct of interest (DeVellis, 2017), and (c) the pool of items needed to be three to four times the anticipated number of items in the final developed instrument (DeVellis, 2017).

Step 3: Select a Form of Scale Measurement

Social science researchers use Likert scales to capture a selected population's perceptions and assumptions concerning a particular phenomenon (DeVellis, 2017; Ho, 2017). Additionally, researchers use the scale to find correlations amongst items in an instrument (DeVellis, 2017, Mvududu & Sink, 2013). Based on the use and purpose of a Likert scale, the researcher used a 5-point Likert scale to measure each item in the HSPS. Furthermore, Kline (2016) supported the use of a 5-point Likert scale, wherein the number of options allows participants taking the survey to differentiate between each value. Finally, in support of the traditional 5-point Likert scale, Willits and colleagues (2016) demonstrated how having a mid-point increases accuracy. Specifically, the midpoint allows the participant to be neutral instead of forcing them to agree or disagree with a statement (Willits et al., 2016).

Conversely, Nadler and colleagues (2015) found that a mid-point reduced the validity of the instrument as the point is an abstract concept interpreted by participants in a variety of ways including (a) neither, (b) no opinion, (c) unsure, or (d) neutral. Considering the number of points, Pemberton (1993) found that an increase from 5 to 7 points increased reliability of the scale but decreased the reliability once it moved beyond 7 points. Based on the findings, Pemberton (1992) concluded that the larger scale provided participants more options to reliably capture their response. Prior to conducting the study, the researcher selected a 6-point Likert scale. She chose this type of scale because it eliminated the abstract nature of the midpoint and encouraged caregivers to express their strength of feeling, which they might otherwise be reluctant to express towards the latent variable being measured (Garland, 1991; Schuman and Presser, 1996).

However, based on the feedback from the expert panel and dissertation committee, the researcher modified the number of scale points from six to five. The researcher opted to make this change because the smaller scale (a) reduced the complexity of the measure, (b) increased response rate and quality, and (c) increased the likelihood of correlations among items (Adelson & McCoach, 2010; Sachdev & Verma, 2004;). Finally, to address the potential abstract nature of the midpoint, the researcher focused on the clarity of each item within the scale addressing both theoretical connections to SPS and applying feedback from the expert panel (Kulas & Stachowski, 2013).

Step 4: Have Initial Item Pool Reviewed by Experts

Expert reviewers are individuals knowledgeable in areas pertaining to the studied phenomenon, and their feedback strengthens content validity of the items included (DeVellis, 2017). Dimitrov (2012) suggested that researchers use each expert's documented feedback to provide rationale as to the inclusion, exclusion, or adaptation of an item. Through feedback, the experts not only strengthen items but also aim to eliminate bias that could impact populations' reported outcomes through the instrument (Dimitrov, 2012; Nunally & Bernstein, 1978). Based on the suggested protocol, the researcher used a panel of experts to review the initial pool of items. Within the expert panel, the researcher recruited individuals with an expertise in early child development, childhood counseling, and instrument development. While developing an instrument, Oh (2018) and Blount (2015) used 5-10 individuals for each of their expert panels. Based on previous studies, the researcher worked to acquire 5-10 experts to inform the selection of items used for the exploratory factor analysis.

Step 5: Consider Inclusion and Validation Items

In the next step of instrument development, the researcher considered items creating bias within respondents' answers and subsequently impact construct validity (DeVellis, 2017). Specifically, the researcher examined the validity of items through convergent and discriminant validity. Because caregivers often view behaviors related to sensitivity, as dysfunctional (i.e., shy, fearful, or over-stimulated; Aron, 2015), the researcher included two scales: *Revised Preschool Anxiety Scale* (PAS-R, Edwards et al., 2010) and the *Autism Treatment Evaluation Checklist* (ATEC; Rimland & Edelson, 1999). Through statistical analysis, the researcher examined correlations between Anxiety and HSPS as well as autism and HSPS. Due to some overlap in symptomology, the researcher predicted that some items related to shyness, fear, and over-stimulation, would highly correlate but that the majority of items showed a weak relationship.

Step 6: Administer items to a Sample Population

The researcher distributed the HSPS online, using a survey link, website, and an online panel data company, Protege. The researcher aimed to recruit a sample with a ratio of 5:1 participant/item ratio resulting in potentially a sample of 400 participants (based on a predicted number of 80 items for the HSPS). Finally, details for administering the scale to the participants can be reviewed above in the section under *Data Collection Procedures*.

Step 7: Evaluate Items

Once the researcher collected all the data, she analyzed items using a variety of statistical procedures to evaluate validity and reliability of HSPS. The researcher assessed the validity to evaluate evidence regarding: (a) test content, (b) response process, (c) internal structure, and (d) relationship to other variables. Additionally, the researcher calculated the Cronbach's alpha and inter-item correlations of the HSPS to assess reliability. Prior to running the exploratory factor analysis, the researcher determined if the data on each item was factorable, assessing for both Kaiser-Meyer-Olkin (KMO; Kaiser, 1974) sampling adequacy and Bartletts test of sphericity (Watson, 2017). Next, the researcher analyzed the psychometric properties from the initial sample, using exploratory factor analysis (EFA). Specifics on the statistical procedures are included under *Data Analysis* in Chapter 3.

Step 8: Optimize Scale Length

In the final step, the researcher eliminated items, one at a time, that fit the data poorly or responses that did not fit the established literature concerning SPS in preschool age children (DeVellis, 2017). Considering poor fit, the researcher used the following statistical measures to assess for removing items: (a) maximum likelihood (ML) when data is normally distributed, and (b) principal axis factoring (PAF) when data normality is problematic (Watson, 2017). Once the researcher completes the initial deletion of items, she then used the following statistical analyses to consider if she should extract factors: (a) Kaiser greater-than-one rule criterion (Kaiser, 1960), (b) scree test (Cattell, 1966), (c) variance extracted, and (d) parallel analysis (PA; Horn, 1965). Watson (2017) challenged the above-mentioned methods of factor extraction. Due to difficulty in interpreting results and in response to the identified challenges, he suggested determining an appropriate factor rotation method (i.e., orthogonal or oblique rotation) to identify strength of factor loadings. Factor rotation methods allow the researcher to simplify the factor structure by increasing high factor loadings and decreasing low factor loadings (Dimitrov, 2012). Finally, Watson (2017) reminded researchers that when deleting items due to low factor loadings, they must look beyond statistical outcomes and consider verbiage, essence, and construct representation thereby determining why items may have a high or low factorability. Finally, Finch (2020) reminded researchers to delete items, one at a time, before repeating the sequence of (a) testing for number of factors, (b) conducting the factor rotation, and (c) assessing if another item should be deleted.

Manual Development

The researcher created a test manual for the HSPS to inform helping professionals (i.e., play therapist, school counselors, therapists, psychologist, etc.) how to administer the instrument. Additionally, the panel of experts, who provided feedback regarding developed indicators in the instrument, also provided feedback on the instrument manual. Specifically, the manual included (a) foundational literature and theory underpinning the HSPS, (b) definitions of both latent variables and indicators, (c) directions for administrating the instrument, (d) a guide for scoring the HSPS, and (e) research conducted on the HSPS. Finally, the researcher provided a copy of the manual to helping professionals upon request via email.

Population and Sampling

Based on the established need of a measurement to assess the highly sensitive trait in children ages 3-5 years of age, the researcher recruited caregivers with preschool age children.

Considering sample size, Hair and colleagues (2010) suggested a minimum sample of 100 individuals when developing a measure, and specifically recommended a ratio of five participants for every item on the assessment when using exploratory factor analysis. Based on the current suggestion, the researcher aimed to have a ratio of 5:1 (Hair et al., 2010). Previous instruments (e.g., unpublished Dutch 38-item sensitivity scale for school-age children, Walda, 2007; Highly Sensitive Child Scale [HSCS], Pluess et al. 2018) totaled between 12-38 items, with an average of 19 items. Furthermore, Hair and colleagues (2010) suggest, when conducting an EFA, using three to four times the number of items of the expected number of items when developing an instrument. Based on previous instruments, the researcher planned on developing approximately 80 items and therefore recruited 1,146 participants to obtain a sample size adequate for an exploratory factor analysis (see Chapter Four for details concerning final sample size).

Inclusion/Exclusion Criteria. Inclusion criteria for the current sample include primary caregivers a) who were 18 years of age or older, (b) who had one child 3 to 5 years of age that exhibits neurotypical development with no current diagnosed developmental delays, (c) who were considered the primary caregiver of the child, (d) whose child primarily lived in their residence, and (e) who could read proficiently in English.

Data Collection Procedures

The researcher obtained permission from Institutional Review Board (IRB) before collecting data. Upon approval, the researcher began recruitment, using a non-probability convenience sampling method (Gall, Gall, & Borg, 2007). The target population for the study was primary caregivers of preschool age children (3-5 years old). The researcher used a convenience sampling method with the following inclusion criteria: caregivers (a) who were 18 years of age or older, (b) who had one child 3 to 5 years of age exhibiting neurotypical development with no current diagnosed developmental delays, (c) who were considered the primary caregiver of the child, (d) whose child primarily lived in their residence, and (e) who could read proficiently in English. The researcher recruited participants by (a) reaching out to leadership in established organizations working with preschool age children, (b) distributing targeted ads through social media platforms to organizations/groups providing support to caregivers of preschool age children (Gall, Gall, & Borg, 2007), and (c) using the online panel data company Protege (Walter, Seibert, Goering, & O'Boyle, 2019). Due to pandemic restrictions, all data collection procedures were limited to both online contact and administration of the survey packet. The researcher collected data from February 1, 2021 to March 31, 2021.

Administration of Initial Surveys. Participants accessed one of two verisons of the Qualtrics survey based on how they were recruited: either researcher-initiated or through the research panel. The Qualitrics survey contained the same instruments (80-item HSPS, PAS, and ATEC); the only differences included (a) type of compensation and (b) the retest follow-up. More specifically, when recruited online through the researcher, participants accessed the survey through a link included in an email, social media ads, or a developed website (www.childsensitivity.com). This Qualtrics survey included an additional question, which invited participants to participate in the test-retest follow-up survey. Upon completion, the researcher asked participants to select one of three early childhood organizations (i.e., Dolly Parton's Imagination Library, National Head Start Association, and UNICEF) to which the researcher would donate a dollar on their behalf for completing the survey. Conversely, when recruited through the panel research company, Protege preselected participants using demographic data (e.g., being a primary caregiver of a preschool age child, proficient in the English language, having a child with no development delays) and then redirected potential participants to the second version of the Qualtrics survey, omitting the final question, which invited caregivers to participate in the retest follow up survey. Upon completion, participants received 100 points, which was equivalent to about $1.00 (Horton & Chilton, 2010; Kees et al., 2017; Paolacci et al., 2010).

Administration of Retest Survey. For the retest data collection, the researcher invited participants, who engaged in the research through email, social media ads, or the website, to a follow-up survey two-weeks later. Cattell and colleagues (1970) stated that test-retest reliability could be assessed within a 2-month period. Watson (2004) recommended that researchers conduct the retest sooner than two-months post the initial survey; therefore, the researcher opted for a time frame of two to three-weeks, allowing for both reminders to be sent and assure stability of measuring the sensitivity trait. To ensure confidentiality, the researcher matched caregivers' data by an assigned participant number. Based on the *Tailored Design Method* (Dillman et al., 2014), the researcher sent participants an initial letter inviting them to complete the retest, starting two weeks after completing the original survey then followed up by two reminder letters, each three days apart

Data Collection Instruments

In this study, the researcher developed the following measures: Highly Sensitive Child-Preschool Age (HSPS) and a comprehensive demographic form. The researcher also used the following instruments in the data collection process: Autism Treatment Evaluation Checklist (ATEC) and Preschool Anxiety Scale - Parent Report (PAS).

Highly Sensitivity Preschool Scale (HSPS)

The main goal of the HSPS was to identify, through caregiver report, children (ages 3-5 years old) who experience stronger neurological and emotional responses to surrounding and experienced stimuli (Pluess et al., 2018). Because researchers have identified approximately 20% of the population possesses the trait of sensitivity (Aron & Aron, 1997; Aron et al., 2012; Pluess et al., 2018; Aron, 2015; Smith, Sriken, & Erford, 2019), the current researcher did not limit recruitment to clinical populations. The researcher developed/created items and utilized a 6-point Likert scale range from (1) *Strongly Disagree* to (6) *Strongly Agree*. To develop the HSPS, the researcher took the following steps: : (a) determined how the highly sensitive trait will be measured, (b) created items for the scales based off of previous scales and established literature on the highly sensitive trait in preschool children, (c) selected a form of scale measurement, (d) reviewed scale items using a panel of experts in the field of child development and child counseling, (e) considered inclusion of validation items, (f) administered the agreed upon items to a sample population, (g) evaluated the items, using an exploratory factor analysis (EFA), and (h) reevaluated items used within the scale based on the statistical analysis of the EFA (DeVellis, 2017; Dimitrov, 2012).

Autism Treatment Evaluation Checklist (ATEC)

The Autism Treatment Evaluation Checklist (ATEC; Rimland & Edelson, 1999) is a research supported, caregiver-rated, 77-item instrument to identify characteristics of autism (e.g. Charman et al., 2005; Coben & Padolsky, 2007; Jarusiewcz, 2002; Meiri et al., 2009) sensitive to change of symptomologies over time. The ATEC, on a 4 point Likert scale, is comprised of four subscales including: (a) Speech/Language/Communication (14 items), (b) Sociability (20 items), (c) Sensory/Cognitive Awareness (18 items), and (d) Health/Physical/Behavior (25 items;

Rimland & Edelson, 1999). Magiati, Yates, Charman, and Howlin (2011) found ATEC on a small sample of children (*n* = 22) to have a high internal consistency for total scores between 0.91 and 0.96 and subscale scores between 0.86 and 0.94, using longitudinal data. These findings are similar to the internal consistency found at baseline for a large sample of children (*n* = 1,300), wherein the researchers conducted a split-half reliability test and found a high internal consistency reliability for both total (α = 0.94) and subscale scores (αs = 0.81-0.92; Rimland and Edelson, 2005). Finally, researchers considered the test-retest reliability and found that in a sample of two to six years-old (*N* = 42) the correlation coefficient was high at r = 0.90, $p < 0.001$ for both total ATEC score as well as all subscales (Freire, & André, 2018).

Preschool Anxiety Scale (PAS)

The Preschool Anxiety Scale (PAS; Spence et al., 2001) is a five-factor model to identify anxiety symptomology in preschool age children. Specifically, the instrument is comprised of 28-items, asking parents to report the frequency of each item on a 5-point Likert scale from 0 ‘not at all’ to 4 ‘very often’. The last item asks parents if their child has experienced a traumatic event (yes/no); if yes, the parent is allotted space to state the type of trauma and to answer an additional five items regarding post-traumatic stress disorder (PTSD) symptoms. These additional items also use the same 5-point scale as the first 28 items. Considering internal consistency, researchers used a sample of caregivers with preschool age children (*N* = 1,138) to conduct an exploratory factor analysis and found a five-factor model: (a) generalized anxiety (r = .90), (b) social anxiety (r = .64), (c) obsessive-compulsive (r = .78), (d) physical injury fears (r = .78), and (e) separation anxiety (r = .94; Mvududu & Sink, 2013). Additionally, the researchers conducted a confirmatory factor analysis and found a strong internal consistency reliability for the PAS total score r = .95 (Mvududu & Sink, 2013).

Assessing Psychometric Properties and Statistical Analysis

To address research question one, the researcher determined the factor structure of the Highly Sensitive Preschool Scale (HSPS) using an Exploratory Factor Analysis (EFA). To determine the needed sample size, the researcher referenced the total number of items (n = 80) and determined the minimum number of participants (N = 400) based on Hair and Colleagues' (2010) guidelines of 5:1. The researcher used stringent guidelines outlined by both DeVellis (2017) and Dimitrov (2012) to conduct the EFA (outlined in Chapter Three).

To address research question two and determine internal consistency reliability for the HSPS, using Cronbach's alpha, the researcher conducted a two-tailed a priori power analysis (G-power 3.1; power = 95%, α = .05, d = .2) and determined 320 participants were needed to attain significance and demonstrate a true correlation in the population.

To address research question three, the researcher conducted an a priori power analysis (G-power 3.1; power = 95%, α = .05, d = .2), and identified 312 participants were needed to attain significance at the moderate level. Specifically, the researcher investigated the relationship between the subscales and total HSPS scores with both the ATEC and the PAS scores. Additionally, grounded in theoretical assumptions that there may be overlap of symptomology, the researcher used both total scores or subscale scores of the three scales to explore the relationship across constructs. To assess the relationship between the variables, the researcher evaluated the results using Spearman rho correlations. When analyzing correlations within social science data, Ferguson (2016) recommended the minimum effect size of 0.2, 0.5 as a moderate effect size, and 0.8 as a strong effect size. Based on the established literature, the researcher hypothesized the HSPS total score would result in moderate to strong correlations with (a) ATEC subscale Sensory/Cognitive Awareness, (b) PAS subscale Generalized Anxiety, and (c) PAS subscale Social Anxiety.

To address research question four, the researcher considered the relationship between HSPS scores and reported demographic data. After conducting an a priori power analysis (G-power 3.1; power = 95%, $\alpha = .05$, $f^2 = .2$), the researcher identified 132 participants were needed to attain significance at the moderate level. Next, the researcher used differential item functioning (DIF) to determine the presence of bias across any items in the HSPS, based on demographic variables (Martinková et al., 2017). The most common methods of DIF include: (a) the Mantel-Haenzel procedure (Holland and Thayer, 1988), and (b) the logistic regression procedure (Swaminathan & Rogers, 1990). Each type of methodology analyzes different types of data (i.e., nominal, ordinal, interval, and ratio). While the Mantel-Haenzel procedure is restricted to nominal data, the logistic regression procedure allows for the use of ordinal as well nominal data. Because the researcher used multiple types of data beyond nominal and ordinal, she chose to analyze the data using a one-way MANOVA, allowing for all types of data. Additionally, by using a one-way MANOVA, the researcher was not only able to detect relationships between the HSPS and reported demographic data, but also determine the intersectionality of participants.

Finally, to address research question five, the researcher administered the HSPS twice to a self-selected sample across a two week time frame to (a) examine test-retest reliability, (b) assess if the highly sensitive trait remained constant over time, and (c) identify if error existed in the stability of the developed HSPS scale, using Pearson product-moment correlation. After conducting a two-tail a priori power analysis (G-power 3.1; power = 95%, $\alpha = .05$, $d = .3$), the researcher determined she needed 134 participants to attain significance at the moderate level.

Finally, the researcher considered values near (a) +1.0 and -1.0 to be strong correlations, (b) +.50 and -.50 to be moderate correlations, and (c) 0 to be weak correlations (Hahs-Vaughn, 2017).

Chapter Summary

In this chapter, the researcher defined SPS and conceptualized the innate temperament trait within preschool age children. Additionally, the researcher underscored the importance of identifying SPS during the formative preschool age years of brain development wherein the quality of the caregiver-child relationship has lasting mental health benefits or consequences for children. Furthermore, the researcher established that the quality of the caregiver-child relationship depends on the "felt safety" a caregiver can provide to a child through increased understanding and acceptance (Qualls & Purvis, 2020). Based on the literature, the researcher established the need for helping professionals to have access to an instrument to identify and to assist caregivers in their recognition and support of their child with sensitivity. Finally, the researcher provided a brief review of the methodology for developing an instrument to measure the sensory processing sensitivity as well as the methods to assess some of the psychometric properties of the measurement. Next, the researcher provided an exhaustive review of the literature in Chapter Two and a more in-depth review of the methodologies she used in Chapter Three.

CHAPTER TWO: LITERATURE REVIEW

Researchers indicate the quality of the parent-child relationship is imperative for long-term mental health outcomes in children and is dependent on the caregivers' understanding and acceptance of their child's behaviors (Bratton, Opiola & Dafoe, 2015; Landreth & Bratton, 2020). Many behaviors, especially ones related to temperament are confusing to parents, creating difficulty for parents to express empathy or to respond adequately. For example, researchers have found that approximately 15-30% of children (Arron & Jagiellowicz, 2012; Lionetti et al., 2018; Pluess et al., 2018) have an innate temperament called sensory processing sensitivity (SPS; Aron & Aron, 1997; Aron, 2015; Pluess et al., 2018). This sensitivity is defined as an individual who experiences stronger neurological and emotional responses to surrounding and experienced stimuli (Pluess et al., 2018). Children with this sensitivity are likely to exhibit stronger, heightened emotions that may overwhelm parents (Aron, 2015). Parents often view these behaviors as disruptive, over-the-top, or extreme, which can cause difficulties in responding to the child's needs appropriately. To address the experienced difficulties, an assessment is needed to empower helping professionals (i.e., counselors, play therapists, psychologists, social workers) to first identify the temperament trait and then educate caregivers concerning the strengths and vulnerabilities of sensitivity in children (Smith, Sriken, & Erford, 2019). Through education, helping professionals can increase caregivers' understanding of their child's behaviors, positively impacting the child's mental well-being through relationship (Opiola & Bratton, 2018).

Recent researchers have established a scale to identify SPS in children 8-18 years old, leaving a gap to assess for the trait in younger children (Pluess et al., 2018). Furthermore, researchers' lack of understanding regarding preschool age children with SPS, limits helping professionals' ability to identify the trait and educate caregivers on how to best support their child (Kertz, Sylvester, Tillman, & Luby, 2019). In many child modalities of therapy, helping professionals view the caregiver as an ally and the expert on their child (Kottman & Meany-Walen, 2018). Furthermore, the helping professional and caregiver collaborate to support the child's overall mental health and well-being. Wallisch, Little, Dean, and Dunn (2020) found that when practitioners utilize parents' knowledge of the child, the accuracy in identifying problematic behaviors increased. Because accuracy of information from caregiver report tends to increase around age three (Wallisch et al., 2020), the findings support the need to collect behavioral information in a systematic, reliable manner to assist in the overall assessment of the child's mental health as early as preschool-aged. Finally, the need for caregivers to understand their child and their subsequent behaviors is supported by the theoretical framework derived from the current researcher's investigation of variables (i.e., empathy and understanding) impacting the quality of the parent-child relationship. Therefore, the current researcher will adapt a scale to measure SPS in preschool age children (3-5 years old) and address the need to identify SPS in this population to better support them.

Theoretical Framework

When a child perceives "felt safety" (Qualls & Purvis, 2020) through their caregivers' acceptance, the child can develop a secure relationship and experience increased emotional health and overall well-being (Guerney, 1964; Landreth & Bratton, 2020; VanFleet, 2013). The "felt safety," also known as experiencing being *seen* by the caregiver, allows the child's brain to further integrate its many facets (i.e., left brain, right brain), resulting in increased self-regulation, overall increased decision-making abilities, and experienced sense of security (Siegel & Bryson, 2019). Siegel and Bryson (2019) discussed a child developing security through the four Ss: being *safe*, *seen*, *soothed*, and *secure*. When caregivers support their child by seeing their child for who they are, recognizing their needs, and helping to sooth the child, then the child can feel secure. Not only does a healthy attachment with the caregiver provide security, but caregivers are also then empowered to better provide their child with emotional support, attention, and/or resources for optimal growth and development (Siegel & Bryson, 2019). Specifically, increased attunement to their child's needs strengthens the parent-child relationship as the caregiver becomes more empathic to their child's emotional needs (Bratton, Opiola & Dafoe, 2015; Guerney, 2000; Landreth & Bratton, 2020). Previous researchers noted that when parents understand their children better, they tend to be more developmentally responsive to their child's behaviors, thoughts, and feelings.

Landreth and Lobaugh (1998) conducted an analysis of covariance (ANCOVA) experimental research study, through a between group analysis, using the adjusted posttest means, investigating the efficacy of filial therapy on ($N = 32$) acceptance of children (*Portal Parental Acceptance Scale* [PPAS]; Porter, 1954), experienced parental stress (*Parenting Stress Index* [PSI]; Abidin, 1983), child problem behaviors (*Filial Problem Checklist* [FPC]; Horner, 1974), and the child self-concept (*Joseph Preschool and Primary Self-Concept Scale* [JSCS]; Joseph, 1979). The participants ($N = 32$; filial group, $n = 16$; control group, $n = 16$) were from a medium-security federal correctional prison with an all-male population. Additionally, the fathers had a mean age of 30.94 in the filial group and a mean age of 30.25 in the control group.

Landreth and Lobaugh (1998) indicated a statistically significant result between groups with fathers in the filial group scoring higher on acceptance of their child, F (1, 29) = 20.47, $p <$ .001 (Porter, 1954). Second, fathers from the filial group scored significantly lower than the control group in experienced stress, $F(1, 29) = 10.08$, $p = .004$ (Abidin, 1983), indicating that learning how to connect with their child led to a decrease in experienced parental stress. Third, fathers in the filial group reported lower scores in identified problem behaviors in their children, Finally, due to limited access to children in the control group, researchers conducted a t-test analysis between the pretest and posttest of the experimental group and found a significant increase in children's self-concept, with a two-tailed correlation (.89) at $p < .001$.

In this study, researchers investigated the impact filial therapy had on outcome variables (acceptance, experienced stress, identified problem behaviors, and child self-concept) of a predicted strengthened parent-child relationship (Landreth & Bratton, 2006; Landreth & Lobaugh, 1998). Through learning and conveying acceptance, empathy, and encouragement, researchers then measured efficacy of filial therapy on the four outcome variables to see if the treatment group was more efficacious than the control group (Landreth & Lobaugh, 1998). In addition, the study was one of the first research studies to assess efficacy of filial therapy with incarcerated fathers. The research design and data collection instruments were sound, and the findings contributed to the counseling literature. However, researchers noted limitations for the study, which included: (a) a small, convenient sample ($N = 36$; participants from medium-security federal prison); (b) a sample that may not be generalizable to the entire prison population due to the abnormally high rate of high school (37%) and college graduates (32%) in the study; (c) inability to have a comparison group for child self-efficacy weakened the significance of the outcome; and (d) absence of longitudinal data to know if effects were sustained post intervention. Nevertheless, the results in the study allowed researchers to conclude that when a caregiver is empowered to know and understand their child, the knowledge not only benefits the parent-child relationship but also increases the child's self-concept. The development of children's self-concept occurs during the preschool age (3-5 years old; Ray, 2016). During these formative years of development, nurturance and understanding are imperative, wherein caregivers support their child's development of self and subsequently their self-esteem (Ray, 2016).

Opiola and Bratton (2018) conducted a replication study of Carnes-Holt and Bratton (2014) to establish Child Parent Relationship Therapy (CPRT), a derivative of filial therapy, as an evidence-based intervention for adoptive families. More specifically, the researchers conducted a randomized control group design study investigating the relationship between CPRT ($N = 49$) number of reported child behavioral problems (*Child Behavior Checklist* [CBCL]; Achenbach & Rescorla, 2000, 2001), level of stress in the parent-child relationship (*Parenting Stress Index, Fourth Edition* [PSI-4]; Abidin, 2012), and number of empathic interactions (*Measurement of Empathy in Adult–Child Interaction* [MEACI]; B. Guerney, Stover, & DeMeritt, 1968; Stover, Guerney, & O'Connell, 1971). The participants ($N = 49$; treatment group of parents, $n = 25$ [51%]; control group or treatment as usual (TAU), $n = 24$ [49%]) were from a large metropolitan area in the southwestern United States. The parents in the treatment group included couples ($n = 20$) and individuals ($n = 5$); while the parents in the TAU group included couples ($n = 18$) and individuals ($n = 6$).

Results indicated a statistically significant between groups interaction (CPRT vs. TAU) and time (pretest vs. posttest) on the total problem behavior score, $F(1, 47) = 17.01$, $p < .001$, $\eta\rho^{2} = .27$. Wherein the researchers identified a significant decrease in problem behaviors in the

CPRT group compared to the TAU group (Opiola & Bratton, 2018). Secondly, a statistically significant finding existed between groups interaction (CPRT vs. TAU) and time (pretest vs. posttest) on the total stress score, $F(1, 47) = 25.20$, $p < .001$, $\eta\rho^2 = .35$. Similarly, to problem behaviors, the CPRT group showed a statistically significant decrease in experienced stress in the parent-child relationship compared to the TAU group. Thirdly, a statistically significant finding existed between groups interaction (CPRT vs. TAU) and time (pretest vs. posttest) on experienced empathy in the parent-child relationship, $F(1, 47) = 61.55$, $p < .001$, $\eta\rho^2 = .57$. Experienced empathy significantly increased compared with parents in the TAU group (Opiola & Bratton, 2018). Viewing the between group measures across time, when parents accept and understand their child, a founding principle of CPRT, there was a decrease of problem (i.e., dysfunctional) behaviors (Landreth & Bratton, 2020). Once a parent discovers the purpose behind their child's behaviors, they can help their child to feel *seen,* develop a sense of felt security*,* which tends to lead to decrease in problem behaviors. Likewise, as parents begin to see their child as an individual, the caregivers understand the purpose of the child's behaviors, stress decreases within the parent-child relationship and empathy increases.

This study investigated outcomes of a strengthened parent-child relationship, secondary to the efficacy of CPRT for adoptive families (Opiola & Bratton, 2018). In addition, the study was a replication study, yet with a true control of another intervention (TAU) to address the limitation of the wait-list control used in Carnes-Holt and Bratton's (2014) study. Furthermore, the research design and data support the movement towards evidence-based practices of CPRT with adoptive families. The researchers noted multiple limitations for the study. The limitations included: (a) a small sample ($n = 49$) (b) sampling homogeneity (all from the same geographical location and 86% were Caucasian) and (c) limitations in understanding if outcome variables also had relationships with one another and were not merely an outcome of the treatment group (CPRT). Nevertheless, Opiola and Bratton (2018) used a more rigorous research design to examine the efficacy of CPRT (Opiola & Bratton, 2018). Since increased parental empathy resulted in decreased problem behaviors and decreased stress, empowering caregivers through awareness is vital for a strengthened parent-child relationship.

Finally, Merz and colleagues (2017) considered the bidirectional relationship amongst parental responsiveness and executive functioning (EF) in preschoolers, who attended a head start program (*n* = 534). More specifically, the researchers conducted a cross-lagged panel structural equation model (SEM) to assess if initial data collection points (T1) including parental responsiveness (observed level of parental warm acceptance, contingent responsiveness, and verbal scaffolding; Landry et al., 2008), delay inhibition (gift wrap delay task; Kochanska, Murray, & Harlan, 2000; Li-Grinning, 2007; gift delay-bow task (Kochanska et al., 2000), and conflict EF (bear/dragon task; Carlson, 2005; Garon et al., 2008; DCCS task [DCCS]; Zelazo, 2006) could predict the same variables 6.5 months later (T2). Finally, researchers controlled for confounding factors including gender, age, race, maternal education, and verbal ability (Expressive One-Word Picture Vocabulary Test [EOWPVT]; Brownell, 2000). Once recruited, researchers randomly selected participants to be in control or intervention groups. The intervention groups included a teacher training in responsive teaching (Early Education Model [TEEM]; Landry, Swank, Anthony, & Assel, 2011) and a responsive parenting intervention (Play and Learning Strategies [PALS]; Landry, Smith, Swank, & Guttentag, 2008). Researchers considered both intervention statuses (control vs intervention) as covariates in the final analysis (Merz et al., 2017).

Through data analysis, the researchers determined the covariates to be gender, age, maternal education, T1 verbal ability, site, cohort, and parenting intervention status (Merz et al., 2017). Furthermore, T1 verbal ability was strongly related to T1 parental responsiveness ($r = .12$, $p < .05$) and T1 delay inhibition was strongly related to both T1 and T2 conflict EF ($r = .35$, $p < .001$). When considering the bidirectional associations between parental responsiveness and conflict EF researchers found that the SEM fit the data well, RMSEA = .03, CFI = .97, SRMR = .05). Furthermore, the T1 parental responsiveness moderated gains in both delay inhibition and conflict EF from T1 to T2 ($\beta = .17$, $p < .05$; $\beta = .13$, $p < .05$). Once researchers controlled for covariates, the researchers found parental expressed empathy, acceptance, and support to be critical in assisting children to develop emotional regulation, measured by delay inhibition, and cognitive reasoning, measured by conflict EF (Merz et al., 2017).

This study investigated bidirectional relationships between parental responsiveness, delayed inhibition, and conflict EF (Merz et al., 2017). The researchers noted multiple limitations for the study. The limitations included: (a) the focus on children, who were economically disadvantaged limited generalizability to other child populations, and (b) the use of only two time points limiting the understanding of the interactions between variables across time (Merz et al., 2017). Despite the limitations, results of the data analysis support Ainsworth and colleagues' (1978) research on attachment wherein parental responsiveness strengthens the parent-child relationship, and subsequently empowers the child to function successfully within their environments through increased emotional regulation and increased cognitive functioning. Finally, results from the study further supported existing literature concerning the neurological benefits of increased parental responsiveness for children as well as the supportive presence of a caregiver, which creates safety for child, functioning as an external regulation system as they encounter daily challenges (Blair, 2010; Siegel & Bryson, 2019).

The evidence of an increased self-concept, emotional regulation, and cognitive functioning, secondary to parental increased understanding and empathy, highlights the importance for clinicians to first identify the SPS trait and then educate caregivers of the trait in their child (Landreth & Lobaugh, 1998). Furthermore, highlighting the need for caregivers to be aware of SPS and how it manifests behaviorally in their child, supports the development of the HSPS. Considering the development of the HSPS, the researcher will explore how previous scholars have categorized development to support the ability to generalize behaviors across the age range of children 3-5 years old.

Development in Preschoolers

Caregivers' awareness of a child's neurotypical stages of development can inform their understanding of their child's behaviors (Dalimonte-Merckling & Brophy-Herb, 2019). For the past century, researchers have established typical maturational paths of children, regarding cognitive, physical, and emotional development (Erikson, 1963; Kohlberg, 1987; Loevinger, 1976; Piaget, 1932/1965). Within the maturational paths, developmentalists have grouped specific ages together, focusing on overarching developmental milestones achieved during specific years of life (i.e., Piaget's stages of cognitive development, 1932/1965). One of the four stages, the Preoperational Stage, include preschool age children ages 3-5 years old. During these years, children work to understand the world through images, words, gestures, and symbols (Piaget, 1932/1965); develop increased body coordination and dexterity (Balch, 2016; Dillman Taylor, 2016; Lee, 2016); and attain confidence to initiate daily activities with both peers and adults while not being hindered by defeat (e.g., initiative vs. shame and doubt; Erikson, 1963). Based on the broad developmental goals established by foundational developmentalists (see Table 1), the researcher will assume sufficient commonalities exist in children ages 3-5, allowing for the identification of behaviors across the continuum of age.

Table 1.

Developmental Theories of Preschool Development

Theory	Age	Stage	Description
Kohlberg's Moral Development (1987)	Preschool	Individualism, purpose, and exchange	Concrete, individualistic perspective; serves own needs; follows rules only when in best interest of self
Piaget's Cognitive Development (1932/1965)	2-7 years	Preoperational	Ability to represent objects through symbols, including language; strong attachment to symbols; increased desire to play
Loevinger's Ego Development (1976)	3-5 years	Impulsive	Child ruled by physical and emotional impulsivity; egocentric; immediate gratification
Erikson's Psychosocial Identity Development (1963)	3-5 years	Initiative vs. guilt	Child initiates action for the sake of action: a need to try but not to accomplish

Within each stage of development, children respond in unique ways to others and their environments (Chess, 1995). Developmentalists have labeled this innate response to one's surroundings as temperament (Chess & Thomas, 1999). When a caregiver understands their child's temperament, they can address and respond to vulnerabilities their child may face along their developmental trajectory (Checa & Abundis-Gutierrez, 2017; Dalimonte-Merckling & Brophy-Herb, 2019). One aspect of temperament, sensory processing sensitivity (SPS), is an innate trait that increases the neurological and emotional responses to surrounding and experienced stimuli Pluess et al., 2018). While researchers have identified the trait with children 8 years of age and older, a gap remains in the literature as to how to identify the trait in preschool age children. To address the gap, researchers need to develop a measurement to identify preschool age children's varying responses to their environment. Prior to determining what SPS may look like in preschool age children, the researcher will first define the temperament trait within its assumed theoretical tenants.

Sensory Process Sensitivity

Sensory processing sensitivity (SPS), found in 15-30% of the population (Arron & Jagiellowicz, 2012; Lionetti et al., 2018; Pluess et al., 2018), is an innate temperament trait impacting how an individual experiences their world. Individuals with SPS, regardless of where they are on the continuum of introversion/extroversion, are born with a heighten sensitivity to their surroundings compared to the general population (Aron, 2015; Aron et al., 2012; Pluess et al., 2018). The experienced heightened sensitivity includes stronger neurological and emotional responses to surrounding and experienced stimuli (Pluess et al., 2018). To assist helping professionals to assess and caregivers to understand SPS in children, Aron (2020) developed the acronym D.O.E.S. **D** stands for depth of processing, which encompasses, but is not limited to, the depth of questions asked by a child, presence of a clever sense of humor, difficulty in making decisions, and the presence of both high emotional reactivity and empathy. **O** stands for easily overstimulated which encompasses a child taking in and noticing *all* subtle or minuet aspects of their surroundings leading to overstimulation and exhaustion. A child that is easily overstimulated has extreme responses to pain or change, frequently experiences meltdowns, and has difficulty falling and staying asleep. Next, **E** stands for emotional reactivity and empathy which comprises, but is not limited to, noticing when others are in distress, feeling deeply, which leads a child to cry often, and responding adversely to doing anything incorrectly. Finally, **S** stands for sensitive to subtle stimuli, which can include, the ability to notice slight changes in appearance of people, places, and things, being aware of communication styles including a glare, sigh, or tone of voice, and to notice slight changes in smells (Aron, 2020). Children with this sensitivity are more in tuned to what coaches or caregivers want or expect from them, increasing their success in various activities (Aron, 2015). Yet, this sensitivity also increases feelings of being overwhelmed from the attunement to others (Aron, 2015). Although research regarding SPS is more recent (Aron & Aron, 1997; Pluess et al., 2018, Smith, Sriken, & Erford, 2019), researchers have observed this sensitivity in humans for centuries. Previous researchers have studied varying aspects of sensitivity including (a) neurasthenia (Beard, 1880), (b) the sensitivity hyperactive emotional syndrome (Jaspers, 1913/1949), (c) introversion (Jung, 1921/1961), (d) sensory processing sensitivity (Aron & Aron, 1997), and (e) environmental sensitivity (Pluess, 2015).

Beard (1880) defined neurasthenia as nervous exhaustion and acknowledged physicians had limited understanding of the ailment. According to Beard (1880), specific temperament traits (i.e., sensitivity to both emotional and sensory stimuli) were present in most individuals that suffered from neurasthenia. To diagnose an individual with neurasthenia, the physicians had to depend on symptoms shared by the patient including emotional experiences. A shift in medical assessments occurred as physicians sought and considered patients' emotional state when providing diagnoses. Overall individuals with neurasthenia reported exhaustion with secondary symptoms such as headaches, sleep disruption, and irritability associated with an emotional disturbance that commonly occurs with depression or anxiety (Beard 1880). Beard (1880) concluded that within a sample of the population a sensitivity existed.

Later Jaspers (1913/1949) observed a sensitivity trait in human beings and labeled these individuals' responses to their environment as a sensitivity hyperactive emotional syndrome. Jaspers (1913/1949) defined the syndrome as an intense response to stimuli input, resulting in a mental health disorder. Both Beard (1880) and Jaspers (1913/1949) considered the sensitivity a disorder and deemed the specific symptomology to cause dysfunction for individuals, who had strong responses to both sensory and emotional stimuli, compared to the general population.

Jung (1921/1961) also theorized sensitivity to the environment, labeling it as introversion. Jung, breaking from Freud's psychoanalytical thinking, conjectured that individuals possess varying and healthy levels of attentiveness to their surroundings. Jung (1921/1961) considered these varying degrees of experienced consciousness as psychological types, with introversion being present in individuals with the highest level of attentiveness. Finally, Jung (1921/1961) believed that clients needed to be aware and accept their introversion to combat negative emotions associated with their sensitivity (Bebee, 2012). Jung (1921/1961) encouraged therapists to be aware of varying levels of sensitivity to avoid misdiagnosing an individual whom, if understood accurately, would be identified as emotionally healthy (Bebee, 2012).

In congruence with Jung (1921/1961), Aron and Aron (1997) also observed that helping professionals misunderstand and pathologize sensitivity in individuals (Aron, 2015; E Aron, 2020). Aron and Aron (1997) labeled this type of sensitivity as sensory processing sensitivity (SPS) expanding inclusion criteria for sensitivity to include all individuals on the introversion/extroversion continuum. Aron and Aron (1997) defined SPS as an innate, unidimensional, temperament trait, in which overarousal occurs in all areas of one's life and is not only related to felt and expressed emotions. Later Aron (2020) described SPS within individuals as experiencing greater sensitivity, depth of processing, and emotional reactivity to stimuli.

Using Aron and Aron's (1997) foundational research, Pluess and colleagues (2018) studied sensitivity in children ages 8-19 years old, labeling sensitivity as environmental sensitivity. The researchers defined environmental sensitivity as the depth to which a child reacts and responds to the environmental stimuli. Pluess (2015) emphasized environmental sensitivity wherein developmental outcomes are dependent upon the child's ability to understand and process their environment (Pluess et al., 2018). Furthermore, the researchers considered environmental sensitivity as a survival tool used to strengthen a child's ability to understand and subsequently be successful within their environments, including school, home, and in social settings with peers. Specifically, the presence of environmental sensitivity enables the child, through heightened insight, to consider factors necessary for success, based on demands placed within the environment (Pluess et al., 2018; Pluess, 2015). Finally, different from Aron and Aron (1997), who believed that sensitivity was a dichotomous category, Pluess and colleagues (2018) theorized that environmental sensitivity was on a continuum ranging from high to low. Pluess and colleagues (2018) identified group norms for SPS in individuals 8-19 years old (M = 12.9) across three groups: high sensitivity (20-35%), medium sensitivity (41-47%), and low sensitivity (25-35%). Additionally, Lionnetti and colleagues (2018) found similar percentages within a sample of individuals (M =19.2) across three groups: highly sensitive (26.58%), medium sensitivity (42.14%) and low sensitivity (31.27%).

Identification of Sensitivity Groups

Specifically, Lionetti and colleagues (2018) considered distinct sensitivity categories in psychology undergraduates (N = 906; subsample A, n = 451 and subsample B, n = 450). More specifically, the researchers conducted a series of confirmatory factor analyses (CFAs) to determine the factorial model that best fit the data. Next, the researchers conducted a latent class analyses on all highly sensitive person (HSP) items, comparing the subsamples A and B, using the following criteria: (a) Akaike's information criterion (AIC), (b) Bayesian information criterion (BIC), (c) Lo-Mendell-Rubin-adjusted likelihood ratio test (LMR-A), and (d) Entropy to determine the presence of sensitivity groups. Finally, using bivariate correlations, multivariate analysis of variance (MANOVA), and Tukey post hoc tests, the researchers determined the presence of both emotionally reactivity (researcher created participant mood self-rating instrument ranging from 0 = Not Sad/Happy at all to 100 = Very Happy/Sad) and personality traits (*Big Five Personality Traits* [Big-Five], Goldberg, 1999) within the established categories of sensitivity (Lionetti et al., 2018).

Through data analysis, Lionetti and colleagues (2018) determined model fit of various CFAs (e.g., one-factor, three-factor, and higher order models) on both subsamples A and B. In subsample A, the researchers found that the model fit indices were inconsistent, assessed as weak when referencing CFI fit indices and adequate based on RMSEA and SRMR fit indices (Fan & Sivo, 2007; Kline, 2016). In subsample A, the researchers found inconclusive model fits for a one- factor and three-factor model: a) a one factor model (CFI = .679, RMSEA = .085, and SRMR = .079) and b) three-factor model (CFI = .798, RMSEA = .068, and SRMR = .080); while the fit with the higher order factor model was acceptable across all fit indices (CFI = .832, RMSEA = .058, and SRMR = .054). In subsample B, the researchers found that the model fit indices were also inconsistent for all the tested models showing weak CFI fit indices across all three models, with the strongest level of fit being the higher order factor model (Fan & Sivo, 2007; Kline, 2016). The fit indices per model for subsample B were as follows: (a) one factor model (CFI = .678, RMSEA = .086, and SRMR = .075), b) three-factor model (CFI =.775, RMSEA = .072, and SRMR = .078), and c) higher order factor model (CFI = .850, RMSEA = .061, and SRMR = .052). Based on the results, the higher order factor model appears to be the best model fit, supported by the change in CFI ($p > 0.01$) between the two subsamples. Therefore, the researchers concluded the HSP scale reflects both the three independent factors as well as the presence of overall sensitivity factor across all items. Next, researchers conducted latent class analysis and established a three-category classification of sensitivity with a significant LMR-A ($p < 0.04$), adequate entropy (0.87), and the lowest BIC and AIC of all other category classifications. The three established categories of sensitivity of the sample were (a) low (31.27%), (b) moderate (42.15%), and (c) high (26.58%). Finally, looking at characteristic differences across groups, the researchers found the most statistically significant correlations with demographic variables were personality traits including both extraversion ($F(2,227) = 6.82$, $p < 0.001$) and neuroticism ($F(2,227) = 44.94$, $p < 0.001$; Lionetti et al., 2018). Specifically, researchers found extraversion negatively correlated with heightened environmental sensitivity while they found neuroticism, characterized by an individual with intense negative emotions, positively correlated with heightened environmental sensitivity. Based on the high environmental sensitivity group reporting increased levels of neuroticism, researchers concluded that individuals in the high sensitivity group were more susceptible to negative stimuli, producing increased negative emotionality. While not statistically significant, researchers also found a correlation between positive environmental stimuli and positive emotionality within the high environmental sensitivity group (Lionetti et al., 2018). With the knowledge that the parent-child relationship can function as an external regulation system and moderate the impacts of negative environmental stimuli (Blair, 2010; Siegel & Bryson, 2019), the data outcomes detected for individuals in the high environmental sensitivity category supports the need for caregivers and helping professionals to identify the presence of SPS in a child.

The researchers investigated the strength of differing factorial models across two samples and subsequently established categories of sensitivity falling on a continuum (Lionetti et al., 2018). The researchers noted a limitation: they used a self-report measure to capture environmental reactivity; and therefore, the chances of participant bias are increased within the outcome measure. Additionally, the researchers noted a lack of generalizability of cutoff scores due to the homogeneity of the sample (Lionetti et al., 2018). Despite the limitations, the findings supported the presence of a sensitivity continuum within individuals and the increased impact of both negative and positive environmental stimuli on individuals with the highest level of sensitivity (Lionetti et al., 2018).

Views Regarding the Sensory Processing Sensitivity Trait

Despite being aware of the presence of SPS, helping professionals hold differing views regarding the impact of SPS on everyday functioning. Some helping professionals view children with SPS as disproportionately emotional (Aron, 2015). Aron (2020) reported that many children tend to view themselves as being *flawed*, a feeling that has evolved due to constantly receiving critiques that their responses to the environment are abnormal. Conversely, other helping professionals view SPS from a strength-based perspective, as an innate part of temperament that allows individuals to have deeper emotional experiences while working to understand their environment (Aron, 2015; Smith, Sriken, & Erford, 2019). Identified behaviors, associated with

SPS, clearly assist in understanding children’s daily life experiences as well as the purpose behind their behaviors. Furthermore, without the established knowledge concerning SPS, helping professionals interacting with these children may misunderstand them and consider their behaviors *flawed*.

Researchers found when helping professionals misunderstand behaviors of children with SPS as flawed, they may misdiagnose (Aron, 2020; Smith, Sriken, & Erford, 2019). Aron (2020) theorized some helping professionals confuse arousal with fear. An individual can demonstrate arousal (i.e., trembling hands or racing heartrate) but not be afraid. A child with SPS is likely to experience feelings of frustration and be overwhelmed when exposed to multiple subtle stimuli rather than experience fear or any sense of danger (Pluess et al., 2018; Smolewska et al., 2006). Based on the inability to differentiate, helping professionals assess the observable behavior (i.e., racing heartbeat), minimize the feelings secondary to the behavior (Aron, 2020), and diagnose the child with anxiety. To combat misdiagnoses of children with SPS, researchers must consider how to aid helping professionals in identifying and differentiating temperament traits from other common childhood mental health diagnoses. In turn, helping professionals will be able to effectively assist caregivers of preschool children with SPS, to understand and support the child's innate responses to stimuli. Furthermore, comorbidity of diagnoses is prevalent in children (Benjamin et al., 1990, Coskun et al., 2012; Rapee et al., 2009) and researchers theorized that overlap in symptomatology leads to misdiagnoses (Aaron and Aron, 1997; Aron, 2015; Rinn et al., 2018). Without the presence of valid measurements, differentiating innate temperament traits from mental health symptomology is a difficult task (a phenomenon explored below within the Overlapping Mental Health Symptomology section).

Instrumentation of Sensory Processing Sensitivity

Supporting differentiation of symptomology, Aron and Aron (1997) developed an instrument to better assess for behaviors associated with SPS and commonly misinterpreted as dysfunctional or disproportionately emotional. Specifically, the researchers developed the Highly Sensitive Person Scale (HSPS; Aron and Aron, 1997) and the Highly Sensitive Child Scale, ages 8-18 (HSCS; Pluess et al., 2018), scales that researchers have shown adequately screen for SPS (Smith, Sriken, & Erford, 2019).

Development of the Highly Sensitive Person Scale**.** Initially, Aron and Aron (1997) developed HSPS to assess for SPS in individuals 18 and older; wherein the researchers predicted they could identify SPS as an innate trait found on a continuum of sensitivity to both environmental and emotional stimulation as well as depth of processing. Moreover, the development of the HSPS (Highly Sensitive Person Scale; Aron & Aron, 1997) is a product of an exploratory qualitative study along with six subsequent quantitative studies producing a unidimensional model with moderate to high convergent validity (Aron & Aron, 1997; Smith, Sriken, & Erford, 2019). Below the current researcher will expand on the findings across these studies.

Study 1. Aron and Aron (1997) explored SPS across a series of studies. In Study 1, a phenomenological qualitative study, the researchers conducted semi-structured interviews with university students (*n* = 12, 31%) and members of a local arts association (*n* = 27, 69%), who range from 18-66 years of age and who considered themselves as highly introverted or easily overwhelmed by stimulation. Within the sample, majority were women (*n* = 22, 56%) and considered themselves to be single (*n* = 31, 79%). The researchers asked interviewees to complete the Myers Briggs Type Indicator (MBTI; Myers, 1962) and a brief attachment-style questionnaire (Hazan & Shaver, 1987). Based on support from the two measures and a thematic analysis of the semi-structured interviews, researchers identified key patterns (e.g., individuals who were highly sensitive and had supportive childhoods had positive outcomes in adulthood; highly sensitive individuals expanded across the extroversion/introversion continuum; and being highly sensitive and having a non-supportive childhood led to negative outcomes in adulthood). From the analysis, the researchers created 27 conceptual items for a potential instrument assessing for SPS.

Through qualitative data analysis, the researchers found introverts and extroverts within the group of highly sensitive interviewees (Aron & Aron, 1997). Furthermore, only about 50% of the interviewees had ever considered themselves as highly sensitive while the rest of the sample learned of the concept for the first time. Researchers also found that many of the interviewees had experienced a healthy and happy childhood despite being highly sensitive, supporting the idea that being highly sensitive is innate and not secondary to any adversities in childhood. These interviewees viewed their sensitivity as a strength and part of their success. Conversely, interviewees who experienced adverse childhood experiences reported their sensitivity as a negative attribute, impeding success in school, career, and relationships. Finally, regardless of whether interviewees viewed their sensitivity as a strength or impediment, both stated awareness of being different from the general population (Aron & Aron, 1997).

Studies 2, 3, and 4. In the three subsequent quantitative questionnaire studies, Aron and Aron (1997) cross-validated the key patterns across three distinct samples. Researchers developed a sensitivity questionnaire for each study based on the developed 27-items from Study 1, wherein items varied across the three studies (i.e., Study 2 included questions 1, 3, 4, 5, 6, 18, 24, and 26; Study 3 included questions 1, 5, 9, 13, 14, 15, 18, 24, and 26; Study 4 included questions 1, 4, 5, 6, 9, 18, and 26). Researchers did not provide a rationale for the selected items for each study. Furthermore, researchers looked to see if the items conceptualized in Study 1 (a) were consistently interrelated, (b) were related to introversion or extroversion (Myers Briggs Type Indicator [MBTI]; Myer, 1962), (c) were related to emotionality, and (d) moderated how individuals experienced their childhoods based on the family environment (i.e. supportive childhood vs. adverse childhood experiences; E Aron & Aron, 1997).

In Study 2, a sample of university students [n = 313] in which majority were women (n = 200, 63%), across three classrooms completed anonymous questionnaires including a nine-item HSPS (Aron & Aron, 1997). Researchers used the results from a subsample [n = 206] who had already completed the MBTI as part of a class assignment to categorize these individuals with introversion or extroversion. Finally, to assess how sensitivity impacted the relationship between perceptions of childhood and family environment, the researchers developed two subsets of questions answered on a 7-point scale, ranging from 1 (not at all) to 7 (extremely). The researchers included these questionnaires in study 2, as well as provided abbreviated versions in studies 3 and 4. In the first set of questions, the researchers considered the parental environment and the other the subjective perception of their childhood including adverse childhood experiences. Aron and Aron (1997) found the interaction between SPS and the items on the parental environment and childhood perception questionnaires to be statistically significant $t(306) = 7.71$, $p < .01$. Furthermore, the researchers found a moderating effect of SPS wherein poor parental environment led to an increased correlation with a perceived unhappy childhood compared to the general population. Unfortunately, the researchers did not provide statistical data to corroborate the described outcomes. For the one-factor model, researchers analyzed the sensitivity items across the three classrooms finding comparable alphas (α = .64, .68, and .66), although unreliable (Kline, 2016). Furthermore, based on the cross-analysis of the HSPS with the MBTI, researchers found a negligible correlation $r = .14$, $p < .10$, suggesting social introversion, while somewhat related to sensitivity, is not identical to being highly sensitive. The finding is congruent with the thematic analysis in Study 1, in which researchers found both introversion and extroversion within their sample. Based on the findings, when creating items to measure SPS, one needs to consider characteristics of SPS to include aspects of both introversion and extroversion. Additionally, understanding that SPS can increase long-term negative perceptions of childhood, which can result in decreased overall well-being, increases the importance of identifying the trait early in development to mitigate the impact poor parental environments can have on a child's well-being into adulthood.

In Study 3, the sample of undergraduates (n = 285) included a majority of women (n = 168, 59%) from seven different universities in the United States (Aron & Aron, 1997). The researchers presented the following instruments within a statistical textbook at all seven universities: (a) an eight-item HSPS, (b) two 2-item researcher-developed questionnaires concerning introversion and emotionality, and (c) two other modified questionnaires concerning parental environment and childhood perceptions. Once students completed the packet of questionnaires, the instructors submitted the anonymous data to Aron and Aron (1997). When researchers analyzed the sensitivity items from the data collected, the reliability index was acceptable ($\alpha = .75$; Kline, 2016), for the unidimensional model. Furthermore, when researchers correlated the HSP scale with items from the emotionality and introversion questionnaire, they found a large, positive correlation ($rs = .58$, $ps < .01$) and a medium, positive correlation ($rs = .31$, $ps < .01$), respectively. While slightly stronger correlations than what was found in Study 2, the Aron and Aron's (1997) findings still indicated SPS variance was not accounted for by either emotionality or introversion. In conclusion, the findings provided data that indicated emotionality can be explained due to the moderate and positive correlation with SPS. Furthermore, a lot of variance unexplained by emotionality remained, establishing the need for future researchers to consider additional characteristics of this temperament trait to fully identify SPS in individuals.

In Study 4, the sample included individuals living in a small town within California [*n* = 299]. Researchers collected data from the rural community to address the over-representation of college undergraduate students in the previous two studies. Demographics of the sample included individuals 18-91 years-of-age (*M* = 43.4), and a near equal representation of women (*n* = 165, 55%) to men (*n* = 134, 45%). During data collection, researchers used a random-digit telephone survey, attaining a 37% response rate, to anonymously collect answers to the 7-items on sensitivity determined in Study 1, and two subsets of questions on perceptions of childhood and family environment (Aron & Aron, 1997). To reduce sampling error, researchers left messages and called up to three additional times for every number that they were not able to reach a participant. Participants answered the same subset questionnaires from previous studies; however, researchers used a modified scoring system for ease of use during data collection over the telephone. Through follow-up quantitative data analysis, researchers found an alpha of .64, a poor value of reliability (Kline, 2016), for the one-factor model, (Aron & Aron, 1997). Additionally, Aron and Aron (1997) found a statistically significant moderating effect of SPS in men ($t|306| = 7.32$, $p < .01$), wherein poor parental environment led to an increased correlation with a perceived unhappy childhood compared to the general population. The same moderating effect of SPS was not found for women with SPS. Thus, the researchers concluded that the personality trait manifest differently across genders (Aron & Aron, 1997). Further researcher is needed to conclude if the difference across genders also occurs in preschool age children.

Across all three studies, researchers found that the alpha did not increase with the removal of any item in the measurement, supporting the presence of each item created from the initial qualitative analysis in Study 1. In addition, emotionality had a moderate positive correlation with high sensitivity (*rs* = .52, .58, and .46, *ps* < .01), indicating that SPS was independent of emotionality, and therefore the researchers challenged the notion that responses from individuals with SPS are a dysfunctional emotional response equated to a mental health diagnosis (Aron, 2015). The researchers were able to deduce from findings that although there is similarity between being highly sensitive and emotionality, these two components can be differentiated. However, future research is needed to confirm similar findings with preschool-aged children.

Study 5. In Study 5, Aron and Aron (1997) accessed a sample of undergraduate students (*N* = 199) to test for both convergent and discriminant validity of the HSP 19-item scale. The researchers selected 11 items, from studies 2-4 and added an additional eight items from the original 27-items in Study 1 to achieve the HSP 19-item scale. Finally, the researchers assessed for discriminate and convergent validity using key constructs to validate the 19 items: (a) extroversion (*Extroversion (E) Scale* [EPI's E Scale]; Eysenck & Eysenck, 1968), and (b) arousability and stimulation (*Questionnaire Measure of Stimulus Screening and Arousabililty*; Mehrabian, 1976). Through data analysis, researchers found support of convergent validity with a strong correlation ($r = .64$, $p < .05$) between the HSPS and the Questionnaire Measure of Stimulus Screening and Arousabililty. Conversely for discriminate validity, the researchers found small, positive correlations ($r = .27$, $p < .05$) between HSPS and introversion (EPI's E

Scale; Aron & Aron, 1997). Based on these findings, the audience can conclude that both arousal and stimulation are responses, experienced by individuals with SPS, to the environment and others. Conversely, introversion does not seem to be a determining characteristic of an individual with SPS (Aron and Aron, 1997). However, future research is needed to confirm similar findings with preschool-aged children.

Study 6. In Study 6, Aron and Aron (1997) used a 19-item HSPS from Study 5 and added eight more items, totaling 27-items, to include perception of subtleties, depth of reflection, and heightened awareness. The researchers' focus, in adding the items, was to move beyond construct validity and create a measure for future research by enhancing content validity. Additionally, the researchers assessed which items intersect or correlate to provide a balanced desirability of items and increase reliability of how the data fit the instrument (Aron & Aron, 1997). The sample (n = 172) included university students in an introductory psychology class, wherein over half were women (n = 109, 63%). Using a scree test, the researchers determined that the first factor accounted for 54% of the overall variance, supporting the presence of a unidimensional model. Furthermore, within the principal factors analysis (PFA) of the 27-item HSPS, researchers found a one-factor, model (α = .87). Across categories of items, there was minimal correlation between SPS and social introversion (r = .45) and emotionality (r = .65). With the addition of eight items, the correlations between SPS and social introversion (r = .23) and emotionality (r = .38) decreased, indicating that items were balanced and not measuring the same aspects of sensitivity (Aron & Aron, 1997). While researchers reported that the addition of the eight items added breadth to the measurement of SPS, the addition seems to contradict one of the main goals of creating a parsimonious instrument. Furthermore, without reported model fit indices, the current researcher cannot generalize as to how the data fit the model. Finally, congruent with what Aron and Aron found in Studies 2-4, differences of SPS across gender was small $t(170) = 3.21$, $p < .01$, with means for women ($M = 4.42$, SD = 0.81) being slightly higher than for men ($M = 4.02$, SD = 0.76).

Study 7. In the last study of this series, the researchers assessed convergent and discriminant validity of the 27-item HSPS from Study 6. The researchers first readministered the HSPS 27-item scale, the *Extroversion (E) Scale* (EPI's E Scale; Eysenck & Eysenck, 1968), and three sensitivity variables unspecified by the researchers to a group of undergraduate psychology students ($n = 109$). Then five days after the first administration, Aron and Aron (1997) administered the *Big Five Personality Factors* (Big Five; Goldberg, 1990) to 64 of the 109 original students matching results using the participants date of birth. To analyze the data, researchers utilized a cross-validation principal factor analysis (PFA) on the finalized 27-item HSPS. Additionally, the researchers utilized a scree test to determine number of factors for this model, wherein the first factor accounted for 47% variance across 27 items. Based on the scree test and analysis of factor loadings, researchers concluded that a single factor model best fit the data. Next, the researchers, using PFA, found an alpha of .85, a very good reliability index (Kline, 2016), further supporting that the single factor model best fit the data. Finally, assessing for convergent and discriminant validity of the HSPS, Aron and Aron (1997) found a statistically significant yet small correlation between the HSPS and the Big Five Assessment (*rs* = .21 to .27, $p < .01$). Therefore, the researchers' findings supported previous findings wherein the HSPS is measuring an aspect of temperament other instruments do not capture (Aron & Aron, 1997). Finally, based on the outcomes, findings suggest the need for an assessment to identify the sensitivity trait in preschool children, a trait currently not identified by other established instruments.

Across the seven studies, the researchers conducted a series of tests to develop and evaluate the HSPS with a variety of subsamples. Specifically, the researchers conducted thematic analysis (Study 1), cross-validation (Study 2-4), analysis to assess for convergent and discriminant validity (Study 5 & 7), and principal factor analysis (PFA) to assess construct validity and reliability of the 27-item HSP scale (Study 6). Researchers recruited samples primarily through convenience sampling at universities but worked to diversify the sample through a community-based sampling in Study 1 and Study 4 (Aron & Aron, 1997). Limitations noted from the research include: (a) the use self-reporting assessment (e.g., researcher created questionnaires concerning parental environments and childhood perceptions used in Study 2, 3, and 4), increasing risk of participant bias; (b) use of smaller samples sizes, instead of combining the data to conduct a single EFA and CFA, and (c) low reliability index values (e.g. Study 4, α = .64; Study 2, α = .64, .68, and .66) that researchers did not address. Despite the limitations, the researchers did an in-depth study of a new phenomenon and developed a measure using both qualitative and quantitative studies. The results from this series of studies provided a comprehensive analysis of assessing for SPS in adults. Using multiple analyses, the researchers developed an instrument with key aspects that may account for a highly sensitive temperament and expanded the rudimentary understanding of SPS beyond emotionality and introversion. Furthermore, while the researchers' identification of the moderating effect of SPS warrants caution, due to participant bias, the researchers' findings highlight the increased long-term negative impact that unhealthy parental environments have on childhood perceptions into adulthood for individuals with SPS (Aron & Aron, 1997). Being aware of long-term impacts on adults increases the need to identify the trait in early childhood.

Additional Models of HSPS

While Aron and Aron (1997) provided evidence in support of the unidimensional factor model, Smolewska and colleagues (2006) revealed limitations, stating that Aron and Aron (1997) could not confirm the one-factor model with their sample population. Specifically, Smolewska and colleagues (2006) found factor loadings ranging from r = .24 to r = .64; some items significantly correlated with the single factor while other items weakly correlated to sensitivity. Although an established view of how to qualify the strength of factor loadings does not exist, Tabachnick and Fidell (2013) generalized that a factor loading < .32 is considered weak. Smolewska and colleagues (2006) also noted the small mean sample size (n < 200) represented across Aron and Aron's (1997) seven studies, failing to meet the standards of the analyses used (Comrey & Lee, 1992; Tabachnick & Fidell, 2013). To address these limitations, subsequent scholars revised the HSPS to consider how data might better fit differing SPS models including: (a) a two-factor model (negative emotionality [NE] and orienting sensitivity [OS], Evans & Rothbart, 2008; (b) a three-factor model (ease of excitation [EOE], aesthetic sensitivity [AES], and low sensitivity threshold [LST], Smolewska et al., 2006; Sobocko & Zelenski, 2015); and (c) a four-factor model (general sensitivity/overstimulation, adverse reactions to strong sensitivity, psychological fine discrimination, and controlled harm avoidance; Meyer, Ajchenbrenner, & Bowles, 2005). Each model is comprised of factors to determine more specifically how each of the 27 items on the HSPS contributes to the overall SPS trait (Smith, Sriken, & Erford, 2019).

Two Factor Models. Evans and Rothbart (2008) considered the psychometric properties of the HSPS, sampling undergraduates (n = 297) at the University of Oregon. Furthermore, the researchers did not provide specifics (i.e., gender, age, or ethnicity) regarding the sample in the publication. The researchers used the original 27-item HSPS from Aron and Aron's (1997) study, along with a brief version (36-items) of the Adult Temperament Questionnaire (ATQ; Evans & Rothbart, 2007). Both scales were presented in unison on a 7-point Likert scale. To analyze the data, Evans and Rothbart (2008) used factor analysis to extract factors. Specifically, Evans and Rothbart (2008) used principal axes factoring (PAF) with oblique rotations (promax with 4 iterations) to explore the factor structure. Using the Velicer minimum average partial (MAP), the researchers determined two overall factors: (a) negative emotionality [NE] and (b) orienting sensitivity [OS]. After deleting an unspecified number of items, the researchers conducted a CFA wherein the RMSEA was .071 and the GFI was .83. While the GFI did not meet the cut-off score, the RMSEA was deemed acceptable (Kline, 2016).

MacCallum and Hong (1997) found that with simpler models and increased degrees of freedom, the chance for error also increased when reporting GFI of a model; therefore, they encouraged researchers to rely on the RMSEA, a fit index that estimates fit of the model more reliably. Thus, the researchers' conclusion that this model had appropriate fit based on the RMSEA is supported by MacCallum and Hong's (1997) findings. Finally, the X^2 test demonstrated that a two-factor solution fit the data better than a single-factor solution [X^2 (1, N = 297) = 279.6 ($p < .001$)], challenging the Aron and Aron's (1997) evidence of a single-factor model (Evans & Rothbart, 2008).

Next, Evans and Rothbart (2008) tested convergent and discriminant validity looking at correlation strengths between the HSPS and ATQ subscales. Based on the analysis, the researchers found that the two factors (NE and OS) did not cross load on any one temperament construct presented in the ATQ. Specifically, the researchers found that NE correlated with negative affect (r =.70), negative affect without discomfort (r =.42), and sensory discomfort (r =.68). Conversely, OS correlated with orienting sensitivity (r =.63), associative sensitivity (r

=.51), and sensory sensitivity (*r* =.52). Furthermore, the researchers concluded that sensitivity (NE) did not directly correlate to discomfort (OS), challenging previous conclusions that sensitivity and vulnerability to sensory discomfort are highly correlated (Aron and Aron, 1997).

Evans and Rothbart (2008) investigated the psychometric properties of the HSPS, with a population of college undergraduates. In the study, some of the noted limitations included: (a) lack of reporting of fit indices to better understand how the data fit the model, (b) a smaller sample size with a poor internal consistency reliability, and (c) a homogenous sample. Despite noted limitations, Evans and Rothbart (2008) were able to establish a two-factor model and conclude that SPS may manifest differently across all aspects of temperament, challenging some of the established literature on the presence of negative aspects of sensitivity (i.e., discomfort; Evans & Rothbart, 2008). When developing an instrument for identifying sensitivity in preschool age children, the researcher must consider the temperament trait holistically, including all components of sensitivity, not just the negative attributes of SPS.

Three Factor Models. Sobocko and Zelenski (2015) considered the psychometric properties of the HSPS, sampling psychology undergraduates (n = 319). Specifically, the sample included a majority of women (n = 178, 56%) with a mean of 1.82 years of study in college. Participants logged into an internet based survey that included the informed consent as well as the series of assessments: (a) the original 27-item HSPS from Aron and Aron’s (1997) study, and (b) personality assessment (*Big Five Factor Inventory* [BFFI], John & Srivastava, 1999). Initially, the researchers conducted an exploratory factor analysis (EFA). The researchers conducted a scree test of the principal axis factoring (with a direct oblimin rotation) wherein they concluded a three-factor model was the best fit for the data. Additionally, the first three components (i.e., factors) accounted for 39.50% of the variance, below the adequate threshold for social sciences (Hair et al., 2010, Mvududu & Sink, 2013). The three factors maintained the labels from Smolewska and colleagues (2006) study: (a) ease of excitation [EOE; $\alpha = .81$], (b) aesthetic sensitivity [AES; $\alpha = .61$], and (c) low sensitivity threshold [LST; $\alpha = .82$]. Finally, EOE and LST are considered to have a very good level of reliability while AES had an poor value of reliability (Kline, 2016). Overall, based on the factor analysis, the data did not fit the model well (Sobocko and Zelenski, 2015).

Finally, when considering divergent and convergent validity, Sobocko and Zelenski (2015) found that HSPS total, EOE, and LST were positively correlated with neuroticism (rs = .44, .50, .27, $ps < .01$) and negative affect (rs = .41, .44, .42, $ps < .05$), and negatively correlated with extraversion (rs = -.22, -.22, -.23, ps <. 01). Finally, AES was positively correlated with openness ($rs = .47$, $p < .01$). Not all components of personality overlapped with the HSPS, including conscientiousness and agreeableness, further supporting the notion that HSPS can be differentiated from the phenomenon of personality. Based on AES unique correlation only to openness, Sobocko and Zelenski (2015) concluded that instead of an instrument measuring a single phenomenon (e.g., Aron and Aron, 1997). Therefore, future researchers may want to investigate the possibility of different types of SPSs.

Sobocko and Zelenski (2015) investigated construct validity of the HSPS with a population of college undergraduates. Limitations which the researchers noted include (a) lack of positive attributes within items on the instrument, and (b) the inability to generalize data due to the small sample size and homogeneity of participants in the study. Despite noted limitations, Sobocko and Zelenski (2015) were able to challenge the notion of a unidimensional model, further exploring if subscales are measuring one single phenomenon or multiple aspects of a construct. The findings can theoretically inform the EFA process when developing the HSPS, calculating the factor structure best fitting for the data.

Smolewska and colleagues (2006) studied the psychometric properties of HSPS using a larger sample of undergraduate students [n = 851, M = 19.7 years] to strengthen parameter estimates and cross validation. Furthermore, the researchers randomly split the sample into two groups: the first group [n = 380] and second [n = 442]. Once researchers determined participants for each sample, they conducted a scree test for factor retention with the first sample. Then the researchers conducted a confirmatory factor analysis (CFA) with group two to confirm the factor structure. Finally, to determine convergent and discriminate validity, the researchers correlated the determined factors from the CFA with subscales of the *NEO-five factor inventory* (NEO-FFI; Costa & McCrae, 1992) and subscales of the *Behavioral Inhibition System/ Behavioral Activation System scale* (BIS/BAS; Carver & White, 1994; Smolewska et al., 2006).

Through the EFA, researchers determined that the HSPS exhibited an overall alpha coefficient of .89 (Smolewska, McCabe, & Woody, 2006). Using the scree test for factor retention, researchers could discriminate three factors. These factors accounted for 40.5 % of the variance, which is below the adequate threshold for social sciences (Hair et al., 2010, Mvududu & Sink, 2013). Researchers labeled the three factors (a) ease of excitation [EOE; i.e. ease of overstimulation in response to both internal and external demands], (b) aesthetic sensitivity [AES; i.e. appreciation for and/or the ability to be moved/inspired by the arts], and (c) low sensitivity threshold [LST; unpleasant arousal to external stimuli such as loud noises]. Additionally, the researchers noted that all three subscales achieved very good to adequate internal consistency reliability of .81, .72, and .78, respectively (Kline, 2016). Across all studies, Smolewska and colleagues (2006) were the only ones to achieve internal consistency reliability across all subscales, but also had one of the largest sample sizes (n = 851). The researchers' analyzed results challenge the original unidimensional model identified by Aron and Aron (1997). Finally, researchers eliminated items that loaded on more than one of the identified factors. Overall, the researchers removed two items from the original 27-item list which included (a) "Are you easily overwhelmed by strong sensory input?" and (b) "Does your nervous system sometimes feel so frazzled that you have to get off by yourself?"

Next using a CFA, researchers confirmed that data from the second sample [n = 442] fit the three-factor model well, X^2 (275, N = 442) = 902.26, p < .001, CFI = .973, and RMSEA = .072. Within the three-factor model, researchers determined intercorrelations between factors (a) r = .40 for EOE and AES, (b) r = .45 for LST and AES, and (c) r = .73 for EOE and LST and concluded that the factors may be measuring some of the same elements of sensitivity. Additionally, researchers' findings regarding strong intercorrelations provides support that all factors are likely measuring the same single factor; a conclusion Aron and Aron (1997) theorized to be true through the presence of a unidimensional model. Finally, researchers determined a positive, medium correlation between BIS and both HSPS [r = .32, p < .01] and the subsequent factors (EOE [r = .36, p < .01], AES [r =. 15, p < .01], and LST [r = .19, p < .01]), and significant relationships between BAS subscale Reward Response and the HSPS [r = .16, p < .01] and the subsequent factors (EOE [r = .19, p < .01], and AES [r = .18, p < .01]. Researchers concluded, based on the strongest relationship between BIS and EOE, individuals who become easily overwhelmed by external stimuli would also innately approach situations and environments with caution to decrease discomfort of overstimulation or inability to stay focused (Smolewska et al., 2006). Based on the findings between subscales, researchers concluded that individuals with high sensitivity experience strong positive emotion when encountering positive stimuli, yet they may not arrive at the stimuli due to personal initiative. Finally, amongst the personality traits, researchers found that the main significant relationship was between Neuroticism and both HSPS [r = .45, p < .01] and the subsequent factors (EOE [r = .48, p < .01], AES [r =. 29, p < .01], and LST [r = .31, p < .01]. Researchers suggested that the personality trait observed as being overwhelmed, supported the strong relationship between Neuroticism and EOE (Smolewska, McCabe, & Woody, 2006).

Within this study, Smolewska and colleagues (2006) focused on the psychometric properties of the HSPS and noted limitations for the study. The limitations included: (a) lack of generalizability, (b) lack of understanding as to how demographic characteristics impact how data fits the HSPS model, and (c) the inability to assess for causal relationships due to the cross-sectional design of the study (Smolewska, McCabe, & Woody, 2006). Despite the limitations, results of the data analysis both support and challenge previous findings from the original Aron and Aron (1997) study. Findings, determined by Smolewska and colleagues (2006), challenged the unidimensional model, demonstrating that the strongest model was a three-factor model. Conversely, Smolewska and colleagues (2006) confirmed strong intercorrelations amongst the three factors, still indicating a single shared factor of sensitivity. Based on researchers' (Aron and Aron, 1997; Smolewska et al., 2006) findings, the current researcher will test both the unidimensional and three factor model to determine best fit for this study's population.

Four-Factor Model. Meyer and colleagues (2005) considered the psychometric properties of the HSPS, specifically comparing the scale to instruments measuring avoidant and borderline personality disorder (APD and BPD), sampling a nonclinical sample (n = 156, M = 30.20) with individuals living in the greater London area. Specifically, the sample included a majority of women (n = 112, 72%), a large population of college students (n = 78, 50%), and only a few individuals who considered themselves to be of an ethnic minority (e.g., Black-Caribbean, and Chinese; n = 18, 11%). The researchers used the original 27-item HSPS from Aron and Aron's (1997) Study 1, along with a series of other instruments to determine the psychometric properties of the HSPS. Furthermore, to determine convergent and discriminate validity, the researchers correlated the determined factors from the principal components analysis (PCA) with factors within a personality disorder assessment looking at both APD (7-item) and BPD (15-item; *Structured Clinical Interview for DSM-IV screening questionnaire* [SCID-II-SQ]; First, Gibbon, Spitzer, Williams, & Benjamin, 1997).

Using both Eigenvalues and the scree test to determine the number of factors retain, Meyer and colleagues (2005) determined four overall discriminated factors, accounting for 48.41% of the variance. This amount of variance is below the adequate threshold for social sciences (Hair et al., 2010, Mvududu & Sink, 2013). Next the researchers labeled the subscales including: (a) General Sensitivity/Overstimulation (GSO; 8 items, α = .82, a very good value of reliability; Kline, 2016), (b) Adverse Reactions to Strong Sensations (ARSS; 4 items, α = .88, a very good value of reliability; Kline, 2016), (c) Psychological Fine-Discrimination (PFD; 4 items, α = .73, an acceptable value of reliability; Kline, 2016), and (d) Controlled Harm Avoidance (CHA; 3 items, α = .56; a poor value of reliability; Kline, 2016). Next, Meyer and colleagues analyzed the data to assess correlations between HSPS and each of the two personality disorder subscales (APD and BPD). While GSO was strongly correlated with both APD (r = .55, p < .001) and BPD (r = .56, p < .001), ARSS had a small, positive correlation with APD (r = .26, p < .001) and BPD (r = .27, p < .001). Additionally, CHA was correlated with APD (r = .23, p < .004), but not BPD (r = .05, p < .56), whereas PFD had a small, positive correlation with BPD (r = .23, p < .004), but not with APD (r = -.08, p < .30). Through correlational analysis, Meyer and colleagues (2005) supported the idea that mental health diagnostic assessments, while some items may identify overlapping symptomology, still do not assess for SPS in its entirety. The identified gap in the scope of current assessments highlights the need to develop an instrument to identify the innate temperament trait in preschool age children.

Meyer and colleagues (2005) investigated discriminant validity of the HSPS, with a population of adults in the greater London area. Based on the results, limitations included poor reliability of the fourth factor (CHA), a frequent problem found across several of the HSPS models and a small sample size (n = 156). Despite noted limitations, Meyer and colleagues (2005) were able to establish a four-factor model and conclude that although SPS may overlap with mental health symptomology, the factor structure supported a distinct construct from mental health diagnoses (e.g., APD and BPD).

Cultural Diversity of HSPS. Researchers have used the HSCS in various cultures, identifying the presence of SPS, and in doing so, have translated the HSCS into at least eight languages, including Spanish, (Montoya-Pérez et al., 2019), German (Gerstenberg, 2012; Konrad & Herzberg, 2017), Norwegian (Liston Grimen & Diseth, 2016), Dutch (Evers, Rasche, & Schabracq, 2008), Turkish (Sengül-Inal & Sümer, 2017), Chinese (Chen et ah, 2011; Chen et ah, 2015), Swedish (Jonsson, Grim, & Kjellgren, 2014; Kjellgren, Lindahl, & Norlander, 2009), Russian (Ershova et al., 2018), and Japanese (Hirano, 2012). Additionally, researchers found moderate effects across cultures, wherein researchers have observed through fMRIs, similar responses in brain activity across varying cultures in individuals who possess the SPS genetic marker (i.e., East Asia and United States; Aron et al., 2010). The current researcher reviewed two studies to highlight similarities and differences of SPS across cultures

Ershova and colleagues (2018) considered the psychometric properties of the HSPS translated into Russian, sampling both undergraduates (*n* = 350, *M* = 18.2) and social media participants (*n* = 510, *M* = 22.6). The researchers combined the samples and then randomly divided into two equal groups. The researchers determined the sample fit best into a two-factor model using a hierarchical cluster analysis with half of the participants (*n* = 430) and then a confirmatory factor analysis (CFA) with the other half (*n* = 430). Specifically, the analysis of fit for the hierarchical cluster analysis was alpha of .75, an acceptable value of reliability (Kline, 2016), for low sensitivity threshold (LST; unpleasant arousal to external stimuli such as loud noises), and .81, a very good value of reliability (Kline, 2016), for ease of excitation (EOE; i.e. ease of overstimulation in response to both internal and external demands). The researchers eliminated the third factor aesthetic sensitivity (AES; i.e. appreciation and/or the ability to be moved/inspired by the arts) and the corresponding items, due to an insignificant reliability index of ∞ = .61, and insignificant correlations with the other two factors, LST and EOE. The researchers then conducted a CFA wherein the data fit the model well as a two-factor model (CFI = .98, RMSEA = 0.031, and CI = 0.014). To verify that the factor AES was still insignificant, the researchers reintegrated the factor into the CFA and found an absence of relationship between AES and the other two factors, LST and EOE (Ershova et al., 2018). Specifically, the insignificant alpha coefficients between AES and EOE < 0.3 and between AES and LST < 0.2 (Kline, 2016). In conclusion, Ershova and colleagues' (2018) found in their analyses that the two-factor hierarchical model best fit the data, which challenged Aron and Aron's (1997) one-factor and three-factor models of the HSPS.

Ershova and colleagues (2018) investigated the psychometric properties, specifically the construct validity of the HSPS, translated in Russian, and with a population of college undergraduates. The researchers noted a limitation for the study was the impact social desirability had on Russian males taking the self-report HSPS. Based on the researchers' knowledge concerning social norms and how Russian males could see admitted sensitivity as a weakness, bias may exist; however, no mention of addressing the concern was included (Ershova et al, 2018). Aron and Aron (1997) studied SPS differences across genders, in six of their seven series of studies, and have found both no statistical differences across genders and minimal statistical difference with women having slightly higher rates of SPS. Researchers conducting subsequent studies, following Aron and Aron (1997), have not researched differences across genders. Yet as noted by Ershova and colleagues (2018) and as supported by Aron and Aron (1997), differences are theoretically plausible and statistically supported. Therefore, opportunities exist for continued consideration regarding confounding variables (e.g., gender) impacting how well data fits a particular model of HSPS (Smith, Sriken, & Erford, 2019).

Montoya-Pérez and colleagues (2019) considered the psychometric properties of the HSPS, translated into Spanish, sampling undergraduates (n = 1050, M = 20.65) at 19 Mexican undergraduate universities. Specifically, the sample included almost twice as many women (n = 676) than men (n = 374). The researchers used the original 27-item HSPS from Aron and Aron's (1997) Study 1, translated into Spanish, using a double translation procedure. For the first sample, the researchers analyzed the data using exploratory factor analysis (n = 525) and then conducted a confirmatory factor analysis (CFA) with the second half (n = 525). Specifically, the analysis of fit for the exploratory factor analysis was α = .89 index, a very good value of reliability (Kline, 2016), for a two-factor model. Because the first factor had a grouping of items never found in previous models, Montoya-Pérez and colleagues (2019) renamed the factor processed sensitivity (PS; sensitivity experienced once the individual understood stimuli).

Subsequently, the second significant factor in the model was low sensory threshold (LST; unpleasant arousal to external stimuli such as loud noises). Finally, the researchers deleted 10 items with the lowest reactive-total correlation ($r < .41$) within the two-factor model.

Next, the researchers conducted a confirmatory factor analysis (CFA) with the remaining 17 items, resulting in a very good value of the reliability index ($\alpha = .88$). Additionally, based on the CFA results, Montoya-Pérez and colleagues (2019) concluded the two factor 17-item model was the best fit for the data (CFI = .90; RMSEA = .07; SRMR = .05).

Montoya-Pérez and colleagues (2019) investigated construct validity of the HSPS, translated in Spanish, and with a population of college undergraduates. The researchers noted a limitation, the lack of discriminate or convergent analysis of any confounding factor including both demographics and mental health symptomology. Montoya- Pérez and colleagues (2019) concluded that, to gain a deeper understanding regarding SPS in adults, future researchers need to consider other factors that may be a at play in individuals with SPS. Additionally, regarding limitation of the sample, the researchers stated that generalizability of findings is limited due to the homogeneity of the participants in the study, including similarities in age, education, marital status, and socioeconomic status. Despite noted limitations, Montoya-Peréz and colleagues (2019) were able to establish a two-factor model and concluded that SPS may manifest differently in individuals across varying cultures, resulting in a diverse number of models to identify the sensitivity temperament trait. Bronfenbrenner's (1979) earlier research supported this conclusion, stating that researchers can observe/understand no characteristic of an individual in a vacuum, but instead must examine the many contexts/environments that impact the individual. Context can be provided by considering the relationship between sensitivity and other confounding variables. Based on the newly identified factor, PS, the researcher will reference these items when developing the item pool for the HSPS.

Development of the Highly Sensitive Child Scale

Focusing on identifying SPS in children, Pluess and colleagues (2018) developed the Highly Sensitive Child Scale (HSCS) adapted from two previous scales, including both the unpublished Dutch 38-item sensitivity scale for school-age children (Walda, 2007) and the 27-item Highly Sensitive Person Scale adapted as a parent-report (HSPS; Aron and Aron, 2002). Furthermore, researchers targeted a sample of children ages 8-19 years across five studies to develop the HSCS and identify categories of sensitivity for the sample studied.

Study 1. In Study 1, Pluess and colleagues (2018) used a sample of 12-year-old children (N = 334) to create the 12-item HSCS from Walda's (2007) established 38 child sensitivity items. Through data analysis, the researchers determined an acceptable fit for a three-factor model with an RMSEA = .06, CFI = .907, and SRMR = .06 and a higher order model with an RMSEA = .06, CFI = .919, and SRMR = .06 (Pluess et al., 2018). The CFI was negligibly stronger in the higher order model, indicating that the three subscales (Ease of Excitation [EOE], Aesthetic Sensitivity [AES], and Low Sensitivity Threshold [LST]) are significant but also load onto the overall sensitivity factor. Additionally, when researchers ran the bivariate associations between the Dutch 38-item sensitivity scale for school-age children and the 12-item HSCS, the scales were highly correlated (r = .93), supporting the fact that the three-factor, 12-item model was measuring sensitivity traits in children similarly to the 38-item scale. Since an established scale for preschool age children does not exist, the researcher will begin with a larger pool of items and then conduct an EFA. Furthermore, due to the strength of the instrument items and the strong fit of the data, the researcher will reference both instrument items and factor analysis when conducting the steps of an EFA for the current study.

Study 2. In Study 2, Pluess and colleagues test the psychometric properties of the 12-item HSCS using a sample of 11-year-olds ($N = 258$), wherein the researchers assessed the relationship between the HSCS and temperament (Early Adolescent Temperament Questionnaire-Revised [EATQR]; Capaldi & Rothbart, 1992), behavioral inhibition (Behavioral Inhibition Scale [BIS]; Carver & White, 1994), and behavioral activation (Behavioral Activation Scale [BAS]; 1994). Through data analysis, the researchers confirmed the higher order model (RMSEA = .01, CFI = .995, and the SRMR = .04). Furthermore, the bivariate associations yielded significant findings in that the correlation between HSCS and total temperament scores (EQTAR) were negligible, wherein the researchers concluded the finding indicates current measurements of temperament lack components of sensitivity. Considering bivariate associations, researchers found that negative emotionality, a subscale of the EQTAR, was correlated ($rs = .16, .13$, $ps < .01, .05$) with EOE and LST respectively, subscales of HSCS; and positive emotionality, a subscale of EQTAR, was correlated ($r = .41$, $p < .01$) with AES, a subscale of HSCS. The researchers' findings create depth into what one might consider negative and positive behaviors attributing to sensitivity items in the HSCS. This dichotomy of positive and negative behaviors represented in each factor could explain the absence of correlation Sobocko and Zelenski (2015) found between AES and the other two factors, EOE and LST, which measured the psychometric properties of the HSPS with undergraduate students. Furthermore, Smith and colleagues (2019) noted both the presence of strengths (i.e., high emotional intelligence) and vulnerabilities (i.e., experienced overstimulation) in having the SPS temperament trait. Based on these results, the current researcher will incorporate both strengths and vulnerabilities to create a balanced item pool to assess for SPS in preschool age children.

Study 3. In Study 3, Pluess and colleagues (2018) assessed the test-retest reliability of the 12-item HSCS using a sample of children with a mean age of 10 (n = 104). Specifically, the sample was comprised of more girls (n = 59, 57%) than boys (n = 45, 43%), and primarily white (n = 84, 81%), at two primary schools in London. The researchers used the original 12-item HSCS, administering the instrument twice within a two-three-week timeframe (M = 15 days, range 9-22 days) wherein students completed a web-based version of the assessment in a school computer lab. To analyze the data, Pluess and colleagues (2018) considered the internal consistency reliability of the 12-item HSCS at both time points and also considered the test-retest reliability by correlating the scores from HSCS total score and subscales from the first timepoint with the subsequent scores from the second timepoint. Overall, the reliability index for the 12-item HSCS at timepoint one (α = .71) and timepoint two (α = .74) was acceptable (Kline, 2016), for the three-factor model. Additionally, the test-retest reliability for the overall scale was below adequate (r = .68; McCrae et al., 2011). Finally, Pluess and colleagues (2018) found that the subscales had both adequate (LST, r = .78, p < .01) and below adequate (EOE, r = .66, p < .01; AES, r = .57, p < .01) test-retest reliability. Internal consistency was adequate overall, yet items were found to be unreliable within two of the three subscales, when measured independently (Pluess et al., 2018). Further, future researchers need to assess the test-retest reliability of an instrument measuring SPS in preschool age children to determine internal validity.

Study 4. In Study 4, Pluess and colleagues (2018) assessed how an older sample of twins, with a mean age of 17 years (n = 1,431), fit the HSCS 12-item model. The researchers used confirmatory factor analysis (CFA), followed by an analysis of psychometric properties of the

HSCS, including descriptive statistics, internal reliability, and bivariate correlations. In general, the sample was comprised of more females (n = 836, 58%) than males (n = 595, 42%), and primarily white (n = 1,330, 93%), living in England and Wales. Additionally, to assess convergent and divergent validity, the researchers used bivariate correlations to assess the relationship between HSC subscales and the big-five personality traits (*Five Factor Model Rating Form*; Mullins-Sweatt, Jamerson, Samuel, Olson, & Widiger, 2006). Initially, Pluess and colleagues (2018) conducted a CFA and determined a strong three-factor model fit (CFI = .935, RMSEA = .06, and SRMR = .05) of the 12-item HSCS. Additionally, the researchers assessed for a higher order model, including the three-factors, and determined a slightly stronger model fit compared to the three-factor model (CFI = .945, RMSEA = .06, and SRMR = .07). When considering descriptive statistics, the researchers found that females scored statistically significantly higher than males on the HSCS ($t(1429) = 6.81, p < .001$). Furthermore, Pluess and colleges determined that internal consistency was very good for the HSCS total scale (α = .82, Kline, 2016) and subscale EOE (α = .81; Kline, 2016), acceptable for the subscale LST (α = .71; Kline, 2016), and poor for the subscale AES (α = .65; Kline, 2016). Finally, using bivariate correlations the Pluess and colleagues (2018) found statistical findings, corroborating Sobocko and Zelenski (2015) findings, noting an absence of relationship between HSCS and both agreeableness and conscientiousness. Furthermore, as with Sobocko and Zelenski (2015) findings, the researchers found a statistically significant relationship between HSCS and a positive relationship with Neuroticism ($r = .31, p < .01$) and Openness ($r = .18, p < .01$), and a negative relationship with Extraversion ($r = -.18, p < .01$). Based on the continued support of particular aspects of personality not overlapping with items in HSCS, the researcher found that HSPS can be differentiated from the phenomenon of personality (Pluess et al., 2018).

Study 5. Finally, in Study 5, Pluess and colleagues (2018) assessed if they could categorize sensitivity on a continuum for children and adolescents in the sample, using the samples from Studies 1, 2, and 4 (n = 592). The researchers theorized that the temperament trait was scaled from high to low levels of the trait instead of the dichotomous labeling of either having the trait or not. Furthermore, researchers assessed if they could approximate cut-off scores for each of the sensitivity groupings within the sample (Pluess et al., 2018). Pluess and colleagues (2018) used latent class analysis (LCA) and found the three-class model best fit the data with the strongest statistical significance (LMR-A = 410.49, $p < .001$) and a satisfactory confidence level (entropy = .85) for both children and adolescents. Furthermore, the researchers established three classes, high sensitivity group (34.08%), medium sensitivity group (41.24%), and low sensitivity group (24.67%). The high sensitivity group included a higher percentage of individuals compared to Aron and Aron's (1997) theory, wherein 20% of the population had SPS. Further research is needed to see if both the sensitivity categories and percentages are similar with preschool age children.

Pluess and colleagues (2018) developed an instrument to identify SPS in children and adolescents from age 8-18 years. Across the five studies, the researchers not only conducted a factor analysis but also assessed psychometric properties of the HSCS assessing descriptive statistics, internal reliability, and bivariate correlations with other similar instruments. Finally, the researchers used latent class analysis (LCA) to assess for categories of sensitivity among the sample of children and adolescents. The researchers noted several limitations including (a) participant bias, since all instruments were self-report measures, (b) lack of diversity within the sample across the studies, and (c) lack of exploration of items starting from the first study with an assumed 12-item measure of sensitivity. Despite noted limitations, Pluess and colleagues

(2018) were able to establish a higher order three-factor model. Based on the findings, the researchers concluded that SPS seems to manifest in children and adolescents similarly to adults (Pluess et al., 2018). Future research is needed for researchers to determine how items identifying SPS in preschool age children, are similar and/or different from current items identifying SPS in school-age children and adolescents.

While researchers have shown the interpretations of data analysis for the HSCS items to be both valid and reliable across children ages 8-18 years of age (Pluess et al., 2018), young children continue to be absent from the literature when considering SPS. Moreover, researchers believe that SPS impacts children from infancy (Aron, 2015), creating a gap in the ability to understand, assess, and support children during their early developmental stages of life. Corroborating with the established literature, researchers have shown how early experiences, before the age of five (Andersen et al., 2008), disproportionately impact an individual's view of themselves, others, and the world (Kottman & Meany-Walen, 2016; McHenry et al., 2014; Perry 2009; Siegel, 2012). Because behaviors change extensively across the first eight years of a child's life (Dougherty et al., 2015; Ray, 2016), construction of instruments must represent a specific developmental period to ensure the tool is sensitive not only to the phenomenon but also to the phenomenon within a developmental context. To ensure a developmental context while also addressing the gap in SPS instrument construction, the researcher will focus on the formative preschool age (3-5 years). Therefore, the current study will revise the HSCS for preschool-aged children.

Sensory Processing Sensitivity in Preschoolers

During the past decade, researchers have challenged the idea that environments do not negatively impact young children (CDC, 2016; McKelvey et al., 2016; Rapee, Kennedy, Ingram, Edwards, & Sweeney, 2005). Not only have researchers shown that traumatic events impact young children, but that children under the age of five are at the highest risk for both presence and chronicity of mental health challenges into adulthood (i.e., isolation, decreased social skills, and the development of unhealthy coping mechanisms; Bright & Thompson, 2018; Rapee et al., 2005). Researchers have also found that the lack of nurturance and traumatic experiences disproportionally impacted children with SPS when compared to the general population (Aron et al., 2005). Conversely, with nurturing and supportive environments these children experienced increased benefits compared to the general population (Aron et al., 2005; Belsky et al., 2009; Pluess & Belsky, 2013). Because preschool age children are part of the most vulnerable within the general population (Andersen et al., 2008; Demir-Dagdas et al., 2018; Kottman & Meany-Walen, 2016; McHenry et al., 2014; Perry 2009; Rapee, Kennedy, Ingram, Edwards, & Sweeney, 2005; Siegel, 2012), understanding their cognitive processes and emotional development is a high priority. If researchers can identify SPS in preschool age children, they could provide additional evidence that children have unique experiences, based on their innate personalities (Rapee et al., 2005).

Further, researchers who studied the SPS trait have found, due to limited awareness and ability to identify the trait, misperceptions of behaviors have subsequently led to an inflated view of dysfunction (Aron, 2015). The inflated view of dysfunction impeded both helping professionals and caregivers' ability to understand the behaviors as a typical response for an individual who feels, thinks, and processes at a deeper level than the general population (Aron, 2010). Researchers have qualified behaviors previously deemed dysfunctional, theorizing that SPS could lead to overstimulation and increased emotionality, due to children's: (a) awareness of even the subtilities in their surroundings, (b) deepened thought processes, and (c) increased empathy for others (Aron, 2015; Pluess et al., 2018). To better understand what is occurring innately for children with SPS, researchers must first identify the trait in preschool age children. Once identified, helping professionals can utilize this information to educate parents on best practices/responses to supporting children with this temperament trait. To broaden understanding related to identification of the trait, researchers must differentiate behaviors related to mental health symptomology compared with behaviors related to SPS.

Overlapping Mental Health Symptomology

Aron and Aron (1997) began their research on SPS based on observations of clients seeking help for unsupported diagnoses. Researchers have found that a heighten sensitivity can be misunderstood as neuroticism, fearfulness, and reactivity (Aron, 2015; Acevedo et al., 2014; Liss, Mailloux, & Erchull, 2008; Smith et al., 2019). They theorized the difficulty in differentiating between traits, was the presence of hesitancy in approaching/encountering new stimuli amongst all traits (Aron & Aron, 1997). Considering differential diagnoses, helping professionals have misdiagnosed due to numerous shared symptomologies across several childhood disorders (e.g., anxiety, and autism spectrum disorder [ASD]; Aron, 2015; Smith et al., 2019). Smolewska and colleagues (2006) have identified correlations between mental health disorders and two subscales of the HSPS and HSCS: Low Sensory Threshold and Ease of Excitation. Some of the correlations related to mental health wellness and symptomology included self-perceived stress (Benham, 2006), anxiety and depression (Bakker & Moulding, 2012; Liss et al., 2008), avoidant personality disorder (Meyer & Carver, 2000), and autism spectrum disorder (ASD; E. Aaron, 2015). The researchers' findings supported two aspects of understanding the sensitivity phenomenon in preschool age children. First, researchers provided the rationale that helping professionals may misdiagnose children with SPS with a mental health disorder because they simply overlook the sensitivity trait (Aron, 2015; Acevedo et al., 2014). Second, previous researchers' findings provided guidance as to what diagnoses may possibly overlap with sensitivity, creating theoretical rationale for possible correlations. The current researcher, therefore, will ground her hypotheses of overlap between the HSPS and anxiety and autism (Liss et al., 2008) to examine discriminant and convergent validity.

Liss and colleagues (2008) considered the relationship between the subscales of the HSPS three-factor model with mental health diagnoses (i.e., autism and anxiety). Specifically, the three subscales were (a) ease of excitation (EOE), (b) low sensory threshold (LST), and (c) aesthetic sensitivity (AES). Researchers collected data by sampling psychology undergraduates (n = 201, M = 18.66) of which the majority were women (n = 142, 71%). The researchers used the original 27-item *Highly Sensitive Person Scale* (HSPS) from Aron and Aron's (1997) Study 1, the *Autism Spectrum Quotient* (ASQ; Baron-Cohen et al., 2001), *Toronto Alexithymia Scale-Revised* (TAS-R; Taylor, 1984, 1995), the *Beck Anxiety Inventory* (BAI; Beck & Steer, 1990), and the *Beck Depression Inventory II* (BDI-II; Beck, Steer, & Brown, 1996; Beck Steer, & Garbin, 1988). Initially, the researchers ran a factorial analysis, unspecified by the researchers, for both a two-factor and three factor model, wherein neither showed adequate fit. The two-factor model results were CFI = .78, RMSEA = .07, and SRMR = .08 while the three-factor model results were CFI = .81, RMSEA = .06, and SRMR = .08. Due to the three-factor having a statistically significant better fit (X^2 (2) = 38.12, p < .001), the researcher used the model for the study.

Using bivariate correlations, Liss and colleagues (2008) considered the relationship between the HSPS subscales and all other scales and subscales. They found that EOE and LST had a small, positive correlation with autism symptomology, including decreased social skills (*rs* = .24, .27, *ps* $\leq$ .001), greater attention to detail (*rs* = .15, *ps* $\leq$ .05) and poor communication (*rs* = .15, .21, *ps* $\leq$ .05, $\leq$ .01). Furthermore, while AES had a small positive correlation with attention to detail (*r* = .29, *p* $\leq$ .001), the subscale had a small negative correlation with poor communication (*r* = -.15, *p* $\leq$ .05). Liss and colleagues (2008) hypothesized that individuals with SPS may retreat from social environments, due to overstimulation negatively impacting both social and communication skills. Finally, EOE and LST had a moderate, positive correlation with anxiety (*rs* = .42, .33, *ps* $\leq$ .001), and AES had a small, positive correlation with anxiety (*r* = .24, *p* $\leq$ .001; Liss et al., 2008). Liss and colleagues (2008) concluded that being so aware of one's own thoughts as well as all subtle stimuli in one's environment could overwhelm an individual and lead to anxiety. Using mental health instruments, the researchers were able to demonstrate that there is an overlap in behaviors, related to anxiety and autism diagnostic items, reported on the HSPS in adults. While studies were based on adults, the researcher hypothesizes that the overlap also exists in preschool age children; therefore, the researcher will use instruments to measure anxiety and autism in preschoolers to determine discriminate and convergent validity.

Liss and colleagues (2008) investigated the relationship between the three subscales of the HSPS with measures of mental health symptomology. Noted limitations of the study included (a) small sample size, (b) homogeneity of sample, and (c) inadequate fit of HSPS factor structure. Despite the limitations, Liss and colleagues (2008) identified relationships between SPS and mental health diagnoses yet were unable to establish the nature of the relationships. Furthermore, the researchers identified the need to consider, through longitudinal studies, how parenting styles effect children with SPS and their development of mental health symptomology in adulthood.

To gain a better understanding of how the parent-child relationship impacts children with SPS, the researcher will develop a caregiver-report instrument to identify parents perceived presence of SPS behaviors in their preschoolers. In assessing the psychometric properties of the items within the HSPS, the researcher will examine discriminant and convergent validity, using both anxiety and autism to identify corresponding behaviors in preschool age children. Finally, as previously discussed, the parent-child relationship continues to theoretically be a variable impacting the well-being of children with SPS. For that reason, the researcher will review current literature studies considering the relationship between the parent-child relationship and the child’s temperament.

SPS and The Parent-Child Relationship

Researchers have considered other variables related to the parent-child relationship when considering the importance of supporting children with SPS. Specifically, researchers have studied how child temperament and parenting styles predict the presence of mental health symptomology (Ryan & Ollendick, 2018). Specifically, when a child experiences rejection from a parent, they then experience an increase of internalizing symptomology (i.e., depression, anxiety; Otto et al., 2016; Yap & Jorm, 2015). Through a review of literature, the researchers considered the short- and long-term impact parenting styles and child’s temperament had on the development of both internalizing and externalizing mental health symptomology in children.

Ryan and Ollendick (2018) conducted a qualitative meta-analysis of established literature considering how the interaction between temperament trait of inhibition and parental behaviors impacted mental health symptomology. In particular, the researchers considered two possible models. In the first model, Ryan and Ollendick (2018) considered how parenting behaviors moderated the relationship between inhibition and internalizing and externalizing behaviors. In the second model, the researchers looked at how the child's temperament of inhibition moderated the relationship between parenting behaviors and the child's mental health symptomology. Finally, the researchers considered other possible relationships between the variables (a) parenting behaviors, (b) child temperament (i.e., inhibition), and (c) mental health symptomology including the bidirectional relationship between temperament and parenting behaviors. The researchers begin the qualitative review by defining each of the three constructs (a) child temperament, (b) parental behaviors, and (c) mental health symptomology. Next, the researchers consider the established bidirectional relationships found in the literature between variables and moderating effects of both parenting behaviors and child's temperament (Ryan and Ollendick, 2018).

Results from the qualitative meta-analysis indicated theoretical notions that when a vulnerable compared to a non-vulnerable child is exposed to a stressor (i.e., poor parenting behaviors), the vulnerable child has a higher probability in developing mental health symptomology (Ryan & Ollendick, 2018; Zuckerman, 1999). Researchers defined vulnerability as presence of extreme inhibition (i.e., being cautious to try new things) or disinhibition (i.e., open to engage in unfamiliar activities) temperament traits in children. Furthermore, when looking at the bidirectional relationship of temperament (i.e., behavioral inhibition) and parenting behaviors, researchers concluded due to the high prevalence of the two-way-interaction between parenting behaviors and child's temperament, they could not simply consider parenting behaviors as the single moderator influencing the interaction between child temperament and mental health symptomology. Identifying both child temperament and parental behaviors as moderators for the development of mental health symptomology further supports evidence of the bidirectional relationship between the two variables. Finally, Ryan and Ollendick (2018) found, in general, parenting behaviors are more likely to moderate the relationship between children with high sensitivity and experienced anxiety instead of children with high sensitivity and experienced depression. While parenting styles, included in the study, speak to acceptance of increased emotionality and sensitivity, one could hypothesize that when caregivers express disappointment or respond through hostile parenting, children with SPS may feel rejected and unsafe to express their experiences. The experienced rejection could lead to an increase of both internalizing and externalizing behaviors.

The researchers conducted a qualitative meta-analysis of the established literature to better understand the interactions between (a) child temperament (i.e., inhibition), (b) parenting behaviors, and (c) developed mental health symptomology (Ryan & Ollendick, 2018). In completing the analysis, researchers noted multiple limitations for the study. The limitations included: (a) differences in defining vulnerable temperaments, (b) the use of varying assessments to measure the three constructs across varying studies, and (c) lack of consistency when considering functional vs. dysfunctional temperament characteristics. Nevertheless, the qualitative review showed how the bidirectional interaction between a child's temperament and parental behaviors is vital when understanding child mental health outcomes (Ryan & Ollendick, 2018). Finally, the researchers' qualitative review of the literature highlights the importance of supporting caregivers, through knowledge concerning SPS. Helping professionals could support caregivers, using a constructed instrument, and in turn empower caregivers to be responsive, understanding their child's vulnerabilities.

More recently, Pinquart (2017) conducted a meta-analysis considering results from 1,435 (published [*n* = 710] and unpublished [*n* = 725]) research studies looking at the impact parenting behaviors have on the development of externalizing behaviors in children and adolescents. Inclusion criteria for selected research studies included (a) observation and assessment of parental behaviors such as parental warmth, behavioral control, psychological control, and autonomy granting, (b) assessment of child or adolescents externalizing behaviors, (c) presence of statistical analysis regarding the relationship between parenting behaviors and child's externalizing behaviors, (d) the mean age had to be < 20 years of age to include both children and adolescents, and (e) studies had to meet the cut-off date of August 2016. Additionally, the researcher selected the following moderating variables to consider throughout the analysis of the research: (a) age of child, (b) child's gender, (c) gender of the parent, and (d) identified externalized behavior. Using the selected constructs, the researcher considered four questions. The first, is whether parental warmth, behavioral control, autonomy granting, and authoritative parenting associated with a decrease of externalizing behaviors, and if the reverse true for harsh control, psychological control, neglectful, permissive, and authoritarian parenting? The second, do stronger associations exists in cross-sectional studies compared to longitudinal studies? The third, do parenting behaviors predict change in the presence of externalizing behaviors in addition to if base line of externalizing behaviors predict changes in parenting behaviors? Finally, the researcher used the Lipsey and Wilson's (2001) 5-step procedure to analyze the data. The researcher assessed the results through a coding process in which inter-rater reliability ranged from 94-97% agreement (Pinquart, 2017). After analysis, the sample consisted of children and adolescents with a mean age of 10.4 years old, 49% of the sample was female, 39.9% of the sample represented an ethnic minority, and majority of the published studies were longitudinal (n = 454; 64%). To answer the first question, the researcher, despite small effect sizes, found higher levels of warmth (r = -.18), behavioral control (r = -.19), autonomy granting

($r = -.11$), and authoritative parenting ($r = -.16$) resulted in decreased exhibited externalizing behaviors. Furthermore, increased levels of harsh control ($r = .21$), psychological control ($r = .22$), and authoritarian ($r = .16$), permissive ($r = .08$), and neglectful parenting styles ($r = .19$) were related to an increased presence of externalizing behaviors. As, predicted for the second research question, the researcher reported stronger associations between warmth, behavioral control, harsh control, and neglectful parenting with externalized behavior for cross-sectional studies than longitudinal studies going from small ($r > .2$) to very small ($r < .2$) effect sizes.

Considering the third question, the researcher found that not only did parenting behaviors predicted externalizing behaviors but that an increased baseline of externalizing behaviors predicted an increase in harsh control ($r = .11$) and psychological control ($r = .09$) as well as a decrease in parental warmth (r = -.06), behavioral control (r = -.07), and autonomy granting ($r = -.05$). While effect sizes were very small, considering the bi-directional relationship between parenting behaviors and established externalizing behaviors shows the impact that externalizing behaviors can have on parents' interactions with their children and establishes the need for continued parental awareness to understand a child's behavior, increase empathy, and continue to provide positive parenting behaviors to support their child (Pinquart, 2017). Causation cannot be determined to further qualify the analysis, yet the findings provide a foundation to hypothesize how the effects of parental behavior may be delayed in children with SPS, manifesting in adulthood. Therefore, if helping professionals can identify SPS during the preschool years, they can then educate caregivers on how to support their child, mitigating long-term negative impacts.

In this study, the researcher reviewed prior research to further understand the impact parenting behaviors and potential moderators may have on the development of externalizing behaviors in children and adolescents (Pinquart, 2017). Overall, two types of parenting behavior, psychological control and harsh control, had the strongest bivariate relationship with developed externalized behaviors. Additionally, the researcher noted in contradiction to some of the established literature on the moderating effects of gender (Moffitt et al, 2001), wherein the variable of gender had, no significant moderator effects on the interaction between parenting behavior and child's externalized behavior. Beyond the findings, the researcher noted limitations for the study. The limitations included: (a) the researcher's inability to explain causality with the established correlations of parenting behaviors, moderating constructs, and developed externalized behaviors; and (b) challenges presented by defining the parenting behaviors being assessed, as not all studies considered those parenting behaviors (Pinquart, 2017). Nevertheless, in spite of a small effect size, the results in the study provided insight into the implication of parenting behaviors when correlating with externalizing behaviors, leaving a gap of potential additional factors that contribute to childhood mental health outcomes, including temperament. Researchers have taken a step further by examining the moderating effect of gender and a child's temperament on the associations of parenting and a child's behaviors problems (Barnette & Scaramella, 2015). Specifically, Barnette and Scaramella (2015) used random effects regression models with restricted maximum likelihood estimates to consider if gender and fear reactivity in preschool age children moderated the associations between observations of maternal parental behavior (researcher developed scale assessing parental behaviors; Early Child Care Research Network, 1999) and their child's behavior (*Child Behavior Checklist* [CBCL]; Achenbach & Rescorla, 2000, 2001). The researchers used a within-family sibling design to explore how the variables related and then considered how the analyzed relationships amongst the variables inform the gap in understanding regarding risky developmental pathways occurring in low-income, African American families. The study families (*N* = 151 families; 302 children; 151

mothers) with children attending Head Start were assessed twice, each with a younger (M = 24.16 months) and older sibling (M = 47.56 months). Overall, the researchers had a 91.7% retention rate from the first to the second data collection point (Barnette & Scaramella, 2015). Results indicated that mothers used a higher level of negative parenting with boys $t(319) = -4.87$, $p < .001$) compared to girls $t(319) = 3.13$, $p < .01$ (Barnette & Scaramella, 2015). Nevertheless, researchers detected no statistically significant mean difference across gender regarding fear reactivity and behavior problems (Barnette & Scaramella, 2015). This finding is consistent with literature on SPS, establishing no statistically significant gender differences within the temperament trait (e.g., Pluess et al., 2018). Additionally, the researchers found a positive relationship between fear distress in boys at Time 2 reported behavior problems on the CBCL (z = 1.99, p = .04; Barnette & Scaramella, 2015). Conversely, there was a decrease in behaviors for boys when there was an increase in child experienced fear distress coupled with supportive parenting. The decrease in behaviors insinuates that a certain level of hesitation (fearful temperament) in boys coupled with supportive parenting is a strength to support the parent-child relationship. Based on the results of the unconditional means model, researchers found a positive relationship between negative parenting and behavior problems only when the child's fear was at ($\beta = .59$, $p < .05$) or higher ($\beta = .77$, $p < .05$) than the sample mean on levels of fear distress. In other words, when preschool age children experienced heightened fear coupled with negative parenting experiences, their problem behaviors increased in the form of fear distress behaviors (Barnette & Scaramella, 2015).

Barnette and Scaramella (2015) investigated significant interactions of children's gender and fear reactivity influence interactions between observed parenting behaviors and parental report of children's problem behaviors (Barnette & Scaramella, 2015). The researchers' analysis highlighted the impact that the presence of temperament sensitivity can both support the parent-child relationship and challenge the parent-child relationship. When a parent was responsive and supportive, the child thrived by exhibiting fewer problem behaviors. Conversely, when the child was met with an absence of support, their sensitivity to their environment was heightened, resulting in an increase in problem behaviors. Within the study, the researchers noted the following limitations: (a) the researchers were unable to decipher causation between variable interactions; and therefore, researchers were not able to determine the direction of effects amongst the variables; (b) observations were only made of mothers and therefore how other caregiver interactions are impacting the child's behaviors could not be taken into consideration; (c) due to the population being economically distressed, generalizability to other populations of children is limited; and (d) mother reports of children's behaviors could be bias or inaccurate (Barnette & Scaramella, 2015). Despite the limitations, Barnette and Scaramella (2015) emphasized how gender and child sensitivity (i.e., fearfulness) moderated the impact of parenting styles had on the presence of externalizing behaviors in preschool age children. The researchers' findings emphasized the importance of identifying the trait during a child's early stages of development and supported the need to develop an instrument for helping professionals to assist caregivers in their recognition and support of their child with sensitivity.

Additionally, Leve and colleagues (2005) found children who possess temperament characteristics of shyness and fear as preschoolers and were disciplined harshly, experienced longer term mental health challenges. Leve and colleagues (2005) found that these individuals were more likely to develop internalizing behaviors by the time they were 17 years of age (Leve et al., 2005). The researchers' findings emphasized the importance of increasing caregivers' awareness of their child's SPS at a young age and support of their child's mental health long-term through developed empathy and understanding. Conversely, harsh parenting with children, who displayed minimal sensitivity, did not show an increase of internalizing behaviors (Leve et al. 2005). Based on the findings, the presence of the sensitivity trait, described as fearfulness and shyness, moderated the presence of internalized and externalized behaviors (Karreman et al., 2010; Leve et al., 2005; Ryan & Ollendick, 2018).

Summary

In this chapter, the researcher defined SPS and conceptualized the innate temperament trait within preschool age children. Defining SPS during the formative preschool age years of brain development is important because SPS can affect the quality of the caregiver-child relationship, impacting children's mental health benefits or consequences (Andersen et al., 2008; McHenry et al., 2014, Perry 2009, Siegel, 2012). The researcher established that the quality of the caregiver-child relationship depends on "felt safety," which a caregiver provides through increased understanding and acceptance (Qualls & Purvis, 2020). Based on the literature, the researcher established the need for helping professionals to have access to an instrument to identify and assist caregivers in the recognition of their child with sensitivity. Instruments exist to identify SPS in children as young as eight-years-of-age (Pluess et al., 2018); yet a lack of an instrument to identify SPS in preschool age children remains. To address the clinical gap, the researcher will develop an instrument measuring SPS specifically for preschool-aged children. The researcher covers the steps for instrument development in Chapter 3, *Methodology*.

CHAPTER THREE: METHODOLOGY

In chapter three, the researcher reviews the methodology and supporting rationale used to develop the *Highly Sensitive Preschool Scale* (HSPS) and test the psychometric properties of the HSPS with a sample of primary caregivers of preschool-aged children (ages 3-5 years old). Specifically, the researcher expounds on the following aspects of methodology regarding the study: (a) research design, (b) statement of problem, (c) population and sample, (d) data collection, (e) instrument development procedures, (f) instrumentation, (g) research purpose and hypotheses, (h) analysis of data pertaining to psychometric properties, (i) ethical considerations, and (j) potential limitations of the study.

Research Design

The researcher conducted an instrument development and validation study to identify caregiver perception of sensory processing sensitivity (SPS) in their preschool age child (Dimitrov, 2012; DeVellis, 2017). The researcher used a correlational research design to examine psychometric properties of SPS (as measured by *Highly Sensitive Preschool Scale* [HSPS]) analyzing both the relationships between items on the HSPS and other instruments (Dimitrov, 2012; DeVellis, 2017).

Statement of the Problem

The inability to recognize sensory processing sensitivity (SPS) in children contributes to viewing innate behaviors as problematic (Aron, 2015). Furthermore, when children's behaviors are misunderstood as problematic, caregivers are likely to exhibit decreased empathy and responsiveness towards their child, resulting in disconnection (Landreth & Bratton, 2020). This disconnection can negatively impact children's overall well-being. When helping professionals identify, and subsequently educate parents about their child's behaviors pertaining to the presence of SPS, the parent-child relationship is likely strengthened through increased empathy and understanding (Browne et al., 2010; Otto et al., 2016; Yap & Jorm, 2015). Scholars view SPS as a temperament trait, impacting both overall awareness of interactions with surroundings and subsequent emotional reactivity to their environment (Aron, 2015; Aron, 2020; Pluess et al., 2018). Although these responses are typical for children with SPS, some helping professionals misinterpret these responses as negative and dysfunctional (Aaron, 2015). Current assessments exist to identify SPS in children as young as eight years old. However, researchers have yet to develop an instrument for younger children. However, researchers have yet to develop an instrument for children ages 3-5 years old, which is a critical time for children's overall emotional development. Rapee and colleagues (2005) noted that emotional wellness is likely to predict mental health wellness throughout the child's life; therefore, considering the developmental needs of preschool age children with SPS, the researcher will create an instrument to identify the presence of the temperament trait based on caregiver report within the general population of children ages 3-5 years. More specifically, based on the inconclusive factor structure of similar scales of sensitivity (Montoya-Pérez et al., 2019; Smith et al., 2019), the researcher was unable to predetermine the number of factors in the HSPS. Therefore, the researcher conducted an exploratory factor analysis (EFA) to determine the factor structure of the instrument.

Population and Sampling

Based on the established need of an instrument to assess the highly sensitive temperament trait in children ages 3-5 years of age, the researcher recruited caregivers with preschool age children. In considering the sample size needed for recruitment, the researcher's goal was to attain an adequate sample size in which stable correlational coefficients were produced, thus increasing the validity of the outcome data (Kyriazos, 2018; Schumacker & Lomax, 2015). While the consensus amongst researchers is that a larger sample produces the strongest correlations, Kyriazos (2018) cautioned researchers against wasting resources by considering other elements of statistical analysis such as reliability. Samples with high reliability tend to need fewer participants to achieve statistical power; researchers cannot determine reliability of the sample until after data analysis, supporting the need to determine a necessary sample size a priori (DeVellis, 2017). While some researchers have created consensus of *N*'s based on previous fit indices within EFA studies (i.e., 100 [Hair et al., 2010], 300 [Tabachnick & Fidell, 2013], and 500 [Comrey & Lee, 1992]), others consider the ratio of participants (*N*) to variables (*p)* (i.e., 5:1; Hair et al., 2010; Kyriazos, 2018). Costello and Osborne (2005) reviewed studies that included EFAs conducted over two years and found that 62.9 % of the studies (n = 303) had a participant to variable ratio below or equal to 10:1, with 27% of these studies used a ratio of 2:1. Based on previous researchers' rationale concerning sample size when conducting an EFA, the researcher followed Hair and colleagues' (2010) 5:1 ratio when calculating sample size. This ratio falls within the Costello and Osborne (2005) findings of appropriate ratios for an EFA sample size and takes into consideration Kyriazos (2018) caution of wasting resources. Finally, the researcher developed the HSPS by modifying previous instruments for developmentally appropriate wording and scouring the literature for additional items. Due to the total number of items (*n* = 80) on the HSPS, the researcher determined the minimum number of participants for this research study to be 400 participants based on Hair and Colleagues' (2010) guidelines of 5:1. Additionally, the researcher considered the needed sample sizes to answer the subsequent four research questions. To determine the needed sample size to determine internal consistency reliability, the researcher conducted an a priori power analysis (G-power 3.1; power = 95%, α = .05, *d* = .2) and determined 320 participants were needed to attain significance and demonstrate a true correlation in the population. For research question three, an a priori power analysis (G-power 3.1; power = 95%, α = .05, *d* = .2) determined the researcher needed 312 participants to attain significance when conducting a Pearson product-moment correlation. For research question four, the researcher conducted an a prior analysis (G-power 3.1; power = 95%, α = .05, f^2 = .0625) to determine the needed sample size of 132 to conduct a MANOVA. Considering the range of needed participants (e.g., 132-400), the researcher determined that a minimum sample size of 400 would be sufficient to run all analyses; therefore, the current sample size of 577 was large enough to attain significance within all the planned statistical analysis.

Finally, the researcher needs a separate sample for research question five to conduct a test-retest reliability analysis. To determine the appropriate sample size, the researcher conducted an a priori power analysis with moderate effects (G-power 3.1; power = 95%, α = .05, *d* = .3) and determined that she needed 134 participants. Based on the analysis and being aware of possible attrition (up to 20%; Gall et al., 2007; Goodrich & Pierre, 1979) between the first and second administration, the researcher recruited 168 caregivers of preschool age children and 97 completed the survey, below the needed 134 yet sufficient to run the analysis at a Cohen's *d* of .35 (*N* = 96).

Inclusion/Exclusion Criteria. Because researchers have identified approximately 20% of the population to have the SPS trait (Pluess et al., 2018; Aron, 2015; Smith et al., 2019), the researcher recruited children from the general population. Specifically, inclusion criteria for the current sample included primary caregivers (a) who were 18 years of age or older, (b) who had one child 3 to 5 years of age exhibiting neurotypical development with no current diagnosed developmental delays, (c) who were considered the primary caregiver of the child, (d) whose child primarily lived in their residence, and (e) who could read proficiently in English.

Recruitment and Sampling Procedures

The researcher obtained permission from the Institutional Review Board (IRB) before collecting data. Upon approval, the researcher began recruitment, using a non-probability convenience sampling method (Gall et al., 2007) by (a) reaching out to leadership in established organizations working with preschool age children, (b) distributing targeted adds through social media platforms to organizations/groups providing support to caregivers of preschool age children (Gall et al., 2007), and (c) using the online panel data company Protege (Walter et al., 2019). Furthermore, the researcher used a single-mode survey (web-based only) approach and used a convenience sampling method for recruitment. Furthermore, the researcher addressed error in the study including: (a) coverage, (b) sampling, (c) measurement, and (d) non-response (Dillman et al., 2014, p. 3).

Coverage Error. To address coverage error (e.g., when individuals from the desired population do not have an opportunity to participate in a study), the researcher sampled caregivers, who have their children in public, private, or homeschool settings. Additionally, the researcher targeted low income and minority populations through Protege.

Sampling Error. To address sampling error (e.g., when the researcher self-selects the individuals to participate in the study creating bias in the research), the researcher used both active (e.g., emailing school administrators and known professionals in the field of early childhood) and passive (e.g., posting Facebook advertisements) recruitment methods to invite individuals to participate in the study. Through email, the researcher recruited caregivers from local preschools by working with the director of research and special projects at the Early Learning Coalition of Orange County, the Early Childhood faculty at the University of Central Florida (UCF), and other known preschool directors across the nation. In response, the following occurred (a) the director of the Early Coalition of Orange County sent out the researcher's IRB approved flyer and written description of the study to 624 preschool directors in Orange County; (b) UCF faculty sent out the researcher's IRB approved flyer and written description of the study to five preschool entities (e.g., UCF Creative School, UCP of Central Florida, Hume House Child Development and Student Research Center); and (c) the researcher sent out an additional seven emails to preschool directors across the United States (e.g., Missouri [2], Indiana [2], and Florida [3]) with the IRB approved flyer and written description of the study.

Within the description, the researcher introduced herself and the study to the preschool directors. Directors only responded via email, with none following up via phone or zoom. If the preschool director agreed to provide access to the school for participant recruitment, then the researcher discussed with the director how to best inform families of the study (i.e., school newsletter, PTA meeting, or having each teacher send out an email or flyer announcement). Due to COVID restrictions, all preschool directors agreed to disseminate the study flyer and description through an email formatted by the researcher. Furthermore, since the researcher did not have direct contact with the participants, she was unable to follow up with preschool directors or participants and provide follow-up reminders as is suggested in the *Tailored Design Method* for these participants (TDM; Dillman et al., 2014).

Measurement Error. To address measurement error (e.g., when participant answers are inaccurate due to either apathy or poor design of research questions; Dillman et al., 2014), the researcher followed DeVellis' (2017) and Dimitrov's (2012) rigorous steps in developing quality instrument questions. Furthermore, to address participant apathy, the researcher provided a clear study description, offering resources for caregivers of preschool children, and limiting the number of items participants were required to complete (Dillman et al., 2014). To bolster evidence based on response process, the researcher implemented several quality checks, typically used in panel research, including: (a) time checks throughout the survey (Kees et al., 2017); (b) verification of a person taking the survey through both "I am not a robot" checkbox and reCAPTCHA to make sure the participants location matches their IP address (Kennedy et al., 2020); (c) two instructional manipulation check questions, which directed participants to select a specific answer (one within demographics and one within the HSPS scale; Kees et al., 2017; Smith et al., 2016); and (d) validity indicators on screening or demographic information (i.e., parents age and year they were born do not match; Chmielewski & Kucker, 2020).

Non-Response Error. To address the non-response error (e.g., when a certain subset of the population responds based on a particular characteristic and therefore limits representation of the entire population being studied; Dillman et al., 2014), the researcher sought to recruit from multiple organizations that serve caregivers of different socioeconomic status (SES) and belief systems (i.e., Mothers of Preschoolers [MOPS]; Caregivers of Preschoolers on Reddit, Mocha Moms, Inc.; Mothers and More; Holistic Moms Network; and Multiples of America), and utilized Protege to target underrepresented populations in the sample. In total, the researcher advertised within 23 Reddit and 10 Facebook groups. Due to extreme homogeneity within the sample, the researcher chose to recruit through Protege, a research panel company, to target underrepresented populations in the sample, recruiting an additional 410 caregivers. To diversify the sample, the researcher requested that Protege recruit at least 50% of the sample who identified as a minority (i.e., person of color), had a bachelor's degree or less, and whose yearly salary was less than $45,000 (Dhayne, Chamoun, & Sokhn, 2018).

Administration of Initial Surveys. For the participant-initiated response surveys, the researcher redirected participants to one of two versions of a Qualtrics survey, dependent on how they were recruited. Both surveys contained the same three instruments (80-item HSPS, PAS, and ATEC) along with the same demographic questions. The differences included recruitment type (i.e., online or panel research company), type of compensation, and the test-retest follow-up survey. More specifically, when recruited online through the researcher, participants accessed the survey through a link included in an email, social media ads, or a developed website (www.childsensitivity.com). This Qualtrics survey included an additional question, which invited participants to participate in the test-retest follow-up survey. Upon completion, participants were asked to select one of three early childhood organizations (i.e., Dolly Parton's Imagination Library, National Head Start Association, and UNICEF) to which the researcher would donate a dollar on their behalf for completing the survey. Conversely, when recruited through the panel research company, Protege preselected participants using demographic data (e.g., being a primary caregiver of a preschool age child, proficient in the English language, having a child with no development delays) and then redirected potential participants to the second version of the Qualtrics survey, omitting the final question for the second administration of the survey offered in the first version of the Qualtrics survey. Upon completion, participants received 100 points, which was equivalent to about $1.00 (Horton & Chilton, 2010; Kees et al., 2017; Paolacci et al., 2010).

Administration of Test-Retest Survey. For the test-retest data collection, the researcher invited participants, who engaged in the research through email, social media ads, or the website, to a follow-up survey two-weeks later. Based on the established literature (e.g., Pluess et al., 2018), the researcher narrowed the second administration to a two to three-week time frame to assess for stability of measuring the sensitivity trait (Cattell et al., 1970; Watson, 2004). Watson (2004) recommended that researchers conduct the retest sooner than two-months post the initial survey. Therefore, the researcher opted for a time frame of two to three-weeks, allowing time for reminders to be sent and to assure stability of measuring the sensitivity trait. Furthermore, the allotted time minimized the possibility of a child's temperament trait to manifest differently due to developmental changes (Cattell et al., 1970; Watson, 2004). To ensure confidentiality, the researcher matched caregivers' data by an assigned participant number. Based on the *Tailored Design Method* (Dillman et al., 2014), the researcher sent participants an initial letter inviting them to complete the retest, starting two weeks after completing the original survey. The researcher then sent up to two reminder letters, each three days apart.

Instrument Development Procedures

The researcher implemented stringent procedures for instrument development as outlined by Dimitrov (2012) and DeVellis (2017). Steps for instrument development included: (a) determining how researchers will measure the highly sensitive trait , (b) creating items for the scales based off of previous scales and established literature on the highly sensitive trait in preschool children, (c) selecting a form of scale measurement based on established literature, (d) reviewing scale items using a panel of experts in the field of child development and child counseling, (e) considering inclusion of validation items, (f) administering the agreed upon items to a sample of caregivers, who had a preschool age child, (g) evaluating the items, using exploratory factor analysis (EFA), and (h) reevaluating item use within the scale based on the statistical analysis of the EFA (DeVellis, 2017).

Step 1: Determine the Characteristics of Sensory Processing Sensitivity

In developing an instrument to measure caregiver perceived SPS in preschool age children (3-5 years old), the researcher clarified the characteristics of SPS (DeVellis, 2017). To address the need of clarity, the researcher reviewed current research pertaining to evidence of test content (i.e., theoretical explanations of the trait and how researchers observe the trait in others) and discriminant evidence (i.e., how the trait differs from other personality traits currently measured across various instruments; DeVellis, 2017). Furthermore, by providing clarity, the researcher illuminated the purpose of the HSPS (Dimitrov, 2012). The researcher's purpose was to design an instrument to measure caregiver perception of sensory processing sensitivity in their preschool age child. If helping professionals can assist in decreasing disconnection through identification of SPS, then they can increase caregivers' ability to understand and see their child. Previous researchers have noted that an increase in caregivers' understanding can strengthen the child's well-being due a sense of acceptance (Guerney, 1964; Landreth & Bratton, 2020; VanFleet, 2013).

Step 2: Create Items for Scale

The researcher created items based on the identified purpose for the scale (DeVellis, 2017). Additionally, the researcher developed an exhaustive list of items, reflecting identified sensitivity in children. In creating the items, the researcher was mindful that some items may reflect similar phenomenon found in other childhood diagnoses/traits (i.e., anxiety and autism, Aron, 2015) and to only include crossover items of similar phenomenon while leaving out the dissimilar ones (Lionetti et al., 2018). Additionally, the researcher made the following assumptions from findings established in the literature concerning SPS: (a) SPS is an innate temperament trait; and therefore the trait cannot be a product of a child's environment (Acevedo et al., 2014; Aron & Jagiellowicz, 2012), (b) SPS is found in about 15-30% of the population (Arron & Jagiellowicz, 2012; Lionetti et al., 2018; Pluess et al., 2018), and (c) SPS can be identified through observations of children's behaviors (Boterberg & Warreyn, 2016; Pluess et al., 2018). Finally, the phenomenon referenced in the creation of items for the HSPS were (a) temperament (*Pathways to Competence for Young Children*; Landy, 2009), (b) sensitivity (*Highly Sensitive Child Scale* [HSCS], Pluess et al. 2018; *unpublished Dutch 38-item sensitivity scale for school-age children;* Walda, 2007), (c) overall emotional well-being (*Child Behavior Checklist* [CBCL]; Achenbach & Rescorla, 2000, 2001), (d) anxiety (*Preschool Anxiety Scale* [PAS]; Spence & Rapee*, 1999*), and (e) autism (*Autism Treatment Evaluation Checklist* [ATEC]; Rimland & Edelson, 1999).

When developing items for the initial instrument, the researcher considered the need for repetition across items. According to DeVellis (2017), to capture the phenomenon of interest (e.g., sensitivity), redundancy of items is needed to decipher the best way to assess for a particular characteristic of the studied phenomenon. While repetition can be helpful, DeVellis (2017) cautioned that researchers should change more than just a word or two in a statement. Instead, researchers should alter the statement, so that the item is viewed differently by the population taking the survey (i.e., My child complains when encountering bright lights; or My child feels calm when the lights are dimmed in their room). Finally, DeVellis (2017) also cautioned researchers to vary item structure. DeVellis (2017) explained how using the same sentence structure or same sentence stem can innately create similar responses from an individual, subsequently strengthening the correlation amongst the items (i.e., starting multiple statement with, “My child doesn’t like…”) by inflating the internal consistency reliability due to redundancy across items (Kline, 2016; Streiner, 2003).

Another way to combat poor internal consistency amongst items is for the researcher to create a large pool of items (DeVellis, 2017). DeVellis (2017) suggested creating a pool of items three to four times the size of the final number of items in the instrument. When researchers write large pool of items, they must consider (a) characteristics of a strong item, and (b) positively and negatively written items. A strong item is brief, written at an age-appropriate reading level (i.e., 5th grade reading level; Watson et al., 1978), and presents a single idea. Subsequently, scholars suggested creating a balance of both positive (representing the presence of a trait/behavior/characteristic) and negative (representing an absence of a trait/behavior/characteristic) statements (DeVellis, 2017; Willits et al., 2016). Based on the scholarly recommendations from the committee, the researcher developed 26 reversed coded statements; each representing the absence of SPS.

Step 3: Select a Form of Scale Measurement

Social science researchers use Likert scales to capture a selected population’s strength of feeling concern towards a particular phenomenon (DeVellis, 2017; Ho, 2017). Additionally, researchers use the scale to find correlations amongst items in an instrument (DeVellis, 2017; Mvududu & Sink, 2013). In reviewing the literature, the researcher found that Kline (2016) supported the use of a 5-point Likert scale wherein the number of options allows participants taking the survey to differentiate between each value. Willits and colleagues (2016) also supported the use of a traditional 5-point Likert scale in which the odd number of points allows a "middle category." Having a mid-point increased accuracy, allowing the participant to be neutral instead of being forced to agree or disagree with a statement (Willits et al., 2016). Conversely, Nadler and colleagues (2015) found that a mid-point reduced the validity of the instrument as the point is an abstract concept interpreted by participants in a variety of ways including (a) neither, (b) no opinion, (c) unsure, and (d) neutral. Considering the number of points, Pemberton (1993) found that an increase from 5 to 7 points increased reliability of the scale but decreased the reliability once it moved beyond 7 points. Based on the findings, Pemberton (1992) concluded that the larger scale provided participants more options to reliably capture their response. Prior to conducting the study, a 6-point Likert scale was selected because it eliminated the abstract nature of the midpoint and encourage caregivers to express their strength of feeling, which they might otherwise be reluctant to express, towards the latent variable being measured (Garland, 1991; Schuman and Presser, 1996).

However, based on the feedback from the expert panel and dissertation committee, the researcher modified the number of scale points from six to five. The researcher opted to make this change because the smaller scale (a) reduced the complexity of the measure, (b) increased response rate and quality, and (c) increased the likelihood of correlations among items (Adelson & McCoach, 2010; Sachdev & Verma, 2004;). Finally, to address the potential abstract nature of the midpoint, the researcher focused on the clarity of each item within the scale addressing both theoretical connections to SPS and applying feedback from the expert panel (Kulas & Stachowski, 2013).

Step 4: Have Initial Item Pool Reviewed by Experts

Expert reviewers are individuals knowledgeable in areas pertaining to the studied phenomenon, and their feedback strengthens content validity of the items included (DeVellis, 2017). Dimitrov (2012) suggested that researchers use each expert's documented feedback to provide rationale as to the inclusion, exclusion, or adaptation of an item. Through feedback, the experts improve content validity and reduce bias by suggesting changes to the wording of items, eliminate irrelevant items, and suggest missing items (Dimitrov, 2012; Nunally & Bernstein, 1978). Based on the suggested protocol, the current researcher recruited a panel of experts to review the initial pool of items. The expert panel was made up of individuals with at least 5 years of expertise in early child development, childhood counseling, and/or instrument development. The expert in early childhood development has a doctorate in early education and has been an educator and researcher in emotional development of early childhood for more than 20 years. Additionally, the three child counseling professionals, each with more than 5 years of clinical experience, provided insight into how sensitivity in preschool age children may impact their emotional well-being. Finally, six individuals had more than 5 years of experience in measurement development, two of which had worked to develop instruments to identify sensitivity in children and were currently living and teaching in Italy and the United Kingdom. These experts assessed the quality of each item by considering the presence of (a) double barreled statements, (b) jargon, (c) loose bundling, (d) sentence complexity, (e) lack of knowledge, (f) social desirability, and (g) leading or loaded statements (DeVellis, 2017). Finally, DeVellis (2017) recommended for researchers to develop an item pool three to four times the size of expected number of items in attempt to capture the complexity of a construct. Previous researchers have used scales with approximately 20 items; therefore, the current researcher created an initial item pool of 130 items that were reviewed by the expert panel. After applying feedback from the expert panel, the researcher deleted 60 items, changed 30 items, and added 10 items, finalizing the HSPS with 80 items.

Step 5: Consider Inclusion and Validation Items

In the next step of instrument development, the researcher assessed bias in participants answers, which subsequently impact construct validity (DeVellis, 2017). Specifically, the researcher examined the validity of items through convergent and discriminant validity (see *Assessing Psychometric Properties and Statistical Analysis* for details). Because caregivers often view behaviors related to sensitivity as dysfunctional (Aron, 2015), the researcher included two scales: *Preschool Anxiety Scale* (PAS, Spence, Rapee, McDonald, & Ingram, 2001) and the *Autism Treatment Evaluation Checklist* (ATEC; Rimland & Edelson, 1999). Through statistical analysis, the researcher explored correlations between Anxiety and HSPS as well as autism and HSPS. Due to some overlap in symptomology, the researcher predicted that some items would be highly correlated (e.g., timidity, fearfulness, and low sensory threshold). However, most items would result in a weak relationship. Finally, the researcher included psychometrics of each scale in the section *Instrumentation*.

Step 6: Administer Items to a Sample Population

The researcher distributed the research packet which included the demographic form, HSPS, PAS, and ATEC using multiple outlets: online groups, email, social media, and a website platform as well as through an online panel data company, Protege, to sample a population of caregivers with a preschool age child.

To estimate the size of the sample population, the researcher considered the following: (a) number of items and (b) participant/item ratio. Based on the final number of 80 items, the researcher aimed to recruit 400 participants.

Step 7: Evaluate Items

Once the researcher collected the data, she analyzed items using a variety of statistical procedures to evaluate validity and reliability of HSPS. The researcher evaluated the validity using the American Educational Research Association's (AERA,1999) standards for educational and psychological testing to evaluate the evidentiary support for: (a) test content, (b) response process, (c) internal structure, (d) relationship to other variables and (e) consequences of testing. AERA's (1999) development of broad areas of validity address the limitations of Cronbach's (1954) condensed conceptualization of validity. The researcher calculated Cronbach's alpha of the HSPS total and subscale scores to assess internal consistency reliability. Additionally, the researcher considered both inter-item and test-retest reliability to further assess homogeneity across items and subscales. Finally, to assure validity of quantitative analyses, the research cleaned the data and tested for statistical assumptions (Osborne, 2013). The researcher covered details pertaining to data cleaning and statistical assumptions in Chapter 4, *Results*.

One critical step in data cleaning is addressing missing data, wherein the researcher must first determine if data is missing completely at random (MCAR; no systematic pattern to the missingness), missing at random (MAR; a predictable pattern in the missingness), or missing not at random (MNAT; participant chooses not to answer a question; Finch, 2020). To address the many types of missing data, researchers have created numerous methodologies to substitute missing values using the mean, median, or regression estimate. Finch (2020) suggested using multiple imputation with chained equations, which researchers most readily use for replacing missing values (MICE; van Buuren, 2007). MICE is specialized, in that the procedure creates an independent equation for each missing value instead of using a general equation for all missing values. Specifically, researchers use MICE for missing data when conducting EFAs. This process is a two-stage estimation (TSE), in which the first stage of analysis, "estimate[d] the covariance matrix for indicators using maximum likelihood (ML) for a fully saturated model" (Finch 2020, p 106). In the second stage, the researchers used the same covariance matrix from stage one to predict model parameters. While TSE is specifically used for missing data when conducting an EFA, McNeish (2017) used a MICE-based approach, predictive means matching, concluding that this approach tends to be the most accurate when conducting an EFA. For this study, the researcher considered the recommendations of previous researchers and determined the best approach to handle missingness of the data was to use multiple imputation with chained equations (MICE).

Prior to running the exploratory factor analysis, the researcher accessed if the data on each item was factorable by exploring the following statistical assumptions if (a) the instrument and sample were homogenous, (b) the indicators were at least interval in scale or at least met the assumptions of linearity in the case of ordinal scales (i.e., Likert scales), (c) outliers were absent, and (d) extreme multicollinearity was not present (Hahs-Vaughn, 2017). To determine absence of multicollinearity, the researcher conducted a linear regression for each item (independent variable) of the HSPS, using the variance inflation factor (VIF) and the Tolerance value. A VIF value < 10 and Tolerance value > 0.10 (Hahs-Vaughn, 2017). Finally, the researcher assessed normality of data and absence of outliers using histograms, quartile plots, probability plots, and skewness and kurtosis (Hahs-Vaughn, 2017).

Once the researcher conducted the analyses to evaluate assumptions, she used the following indices to conduct the initial factorability assessment (a) correlation coefficient values, (b) Kaiser-Meyer-Olkin (KMO; Kaiser, 1974) sampling adequacy, and (c) Bartlett's test of sphericity (Hahs-Vaughn, 2017; Watson, 2017). The correlation coefficient value needed to be ≥ .30, and if the researcher identified a coefficient to be less than .30 and not theoretically critical, she removed the item (Hahs-Vaughn, 2017). Additionally, the researcher needed to determine statistical significance using Bartlett's test of sphericity and KMO values. Specifically, KMO values needed to be ≥ .60 to be considered mediocre and ≤ .90 for the researcher to consider the item very good (Kaiser & Rice, 1974). Finally, the researcher analyzed the psychometric properties from the initial sample, using exploratory factor analysis (EFA), and the researcher has detailed specifics on the statistical procedures of this analysis in the section *Data Analysis*.

Step 8: Optimize Scale Length

In the final step, the researcher extracted, rotated, and eliminated latent variables on the HSPS optimizing the model for best fit of the data (DeVellis, 2017; Finch, 2020). Initially, the researcher considered the following statistical analyses to assess factor extraction: (a) maximum likelihood (ML), (b) principal axis factoring (PAF), and (c) principal components analysis (PCA; Finch, 2020; Watson, 2017). Within the literature, researchers use both ML and PAF most frequently in factor extraction (Finch, 2020). Furthermore, researchers use ML when data is normally distributed and PAF when data normality is problematic (Finch, 2020; Watson, 2017). Researchers do not use PCA to study latent structure but instead to reduce variability amongst indicators (e.g., items) typically followed by a subsequent analysis (e.g., multivariate analysis) (Costello & Osborne, 2005; Henson & Roberts, 2006; Widaman, 2007). The researcher analyzed the data using scatterplots and histograms and found that data normality was not problematic (see

Chapter 4 for more details). Therefore, the researcher decided to use ML as the method for factor extraction.

Considering factor rotation, the goal is to maximize loadings so that each indicator primarily relates to a single latent variable (Finch, 2020). Overall, researchers use two categories of rotation methods with exploratory factor analysis (a) Orthogonal rotation, and (b) Oblique rotation (Finch, 2020; Watson, 2017). When researchers use orthogonal rotations, they assume an absence of correlations amongst latent variables while oblique rotations allow factors to correlate with each other. Finch (2020) questioned the reality of having latent variables that did not correlate, even if by a small margin. Based on the high probability in social sciences that some degree of correlation is expected (Costello & Osborne, 2005), the researcher chose an oblique rotation. If interfactor correlations exist at 0.2 or larger (e.g., moderate effect size; Cohen, 1988), then the researcher will continue to use a form of oblique rotation. Conversely if correlations are miniscule, then the researcher will use orthogonal rotations. Within each category of rotations, subtypes exist; wherein researchers consider the extent of predetermined model structures to then decide which rotation method(s) meet the needs of the factor analysis being conducted. Interfactor correlations ranged from 0.146 - 0.436. While some values were found to be below the 0.2 cut-off (Cohen, 1988), all interfactor correlations had a non-zero correlation, with some even having a moderate effect size (> .2; Finch, 2020). Because of the observed correlations, the researcher proceeded with an oblique rotation.

Due to the high probability of interfactor correlations (Finch, 2020), the researcher focused on subtypes within oblique rotations including: (a) Promax (Hendrickson & White, 1964), (b) Oblimin (Jennrich & Sampson, 1966), (c) Goemin (Yates, 1987), (d) Target Factor Rotation (Horst, 1941; Tucker, 1940), and (e) Bifactor Rotation (Jnnrich & Bentler, 2011). In general, all subtypes of Oblique Rotations produce two sets of factor loadings: (a) pattern matrix (e.g., identifying relationships with each observed indicator and each latent variable while controlling for variance with other factors), and (b) structure matrix (e.g., identifying relationships between indicators and latent variables without controlling for other factors). When determining the type of oblique rotation to use, researchers have conducted simulation studies and found that no one best technique exist for a particular model fit (Finch 2011; Sass & Schmitt, 2010). Instead, researchers suggested using at least two methods of factor rotation to see if one is more strongly supported by both statistics and theory. Furthermore, researchers should consider the purpose of each factor rotation to decide which to use. Researchers most widely use Promax and Oblimin factor rotation methods when conducting an exploratory factor analysis (Finch, 2020). The two factor rotation methods commonly produce similar results; yet at times, the resulting models differ on how items load onto factors. While Oblimin factor rotation yields high eigenvalues, the results are difficult to interpret (DeVellis, 2017). Finally, the use of the remaining three factors rotation methods, Goemin, Target Factor, and Bifactor Rotations, assume at least a partially known factor structure. Researchers typically use these factor rotation methods when conducting a confirmatory factor analysis (CFA). Due to the exploratory nature of the analysis and the inconclusive factor structure of similar scales of sensitivity (Montoya-Peréz et al., 2019; Smith, Sriken, & Erford, 2019), the researcher was unable to predetermine the number of factors in the HSPS. Based on the established literature, the researcher used Promax to compare and determine the factor structure of the model identifying caregiver perception of sensitivity in their preschool age child.

Once the researcher completed the adjustments of factor loadings, she interpreted the factors. DeVellis (2017) suggested that to retain a factor at least two corresponding items should exist. Furthermore, Tabachnick and Fidell (2013) suggested retaining items only when factor loadings are ≥ .32. Once the researcher determined factors, she labeled each in a such a way as to not create response bias from the sample of caregivers. Specifically, the researcher created labels ensuring each represented all items within a factor (Watson, 2017). Finally, completing an EFA does not produce a final model, but instead a provisional one from which the researcher will confirm or challenge the structure through subsequent statistical analysis.

To assess the EFA factor structure, the researcher considered factor retention through (a) Kaiser great-than-one rule criterion (Fabrigar & Wegener, 2011; Kaiser, 1960), (b) scree test (Cattell, 1966), (c) residual correlation matrix, (d) Chi-Square goodness of fit test for maximum likelihood (ML), (e) parallel analysis (PA; Horn, 1965), and (f) minimum average partial (Velicer, 1976). While researchers frequently use Kaiser criterion, scree test, and ML as factor retention methods, researchers have found each to have limitations regarding inaccurate number of suggested factors to retain (Crawford & Koopman, 1979; Linn, 1968; Pett et al., 2003; Tong & Bentler, 2013). Whereas many scholars have found accurate factor retention numbers using PA (Fabrigar & Wegener, 2011; Thompson and Levy, 2016; Socha & Bandalos, 2015). If the eigenvalue is greater than or equal to the 95th percentile of the generated data, the researchers should retain the factor. Due to the many viable methods to determine factor retention, Finch (2020) suggested using several options and then comparing the results with theoretical knowledge to find the strongest model to fit the data. Based on all the established research, the researcher used the following factor retention methods: (a) parallel analysis, (b) scree plot, and (c) Kaiser great-than-one rule criterion. Next, the researcher compared results with established theory concerning sensitivity and compared the extracted factors to create the best model fit for the data.

Manual Development

The researcher created a test manual for the HSPS to inform helping professionals (i.e., play therapist, school counselors, therapists, psychologist, etc.) how to administer the instrument. Additionally, the panel of experts, who provided feedback regarding developed indicators in the instrument, also provided feedback on the manual. Specifically, the manual included (a) foundational literature and theory underpinning the HSPS, (b) definitions of both latent variables and indicators, (c) directions for administrating the instrument, (d) a guide for scoring the HSPS, and (e) research conducted on the HSPS. Finally, the researcher provided a copy of the manual to helping professionals upon request via email. See Appendix F for the manual.

Instrumentation

In this study, the researcher developed the Highly Sensitive Child Scale-Preschool Age (HSPS) and created a comprehensive demographic form. The researcher also used the following instruments in the data collection process: Autism Treatment Evaluation Checklist (ATEC) and Preschool Anxiety Scale, Parent Report, (PAS). The researcher assessed construct validity of the HSPS by assessing how items relate to items on the ATEC and PAS. In doing so, the researcher provided data to inform how correlations between SPS symptomology and other mental health diagnoses (i.e., anxiety and autism), challenge the process of differentiation (Aron, 2015; Smith et al., 2019). Across studies, researchers have identified correlations between mental health disorders and two subscales of the HSPS and HSCS: Low Sensory Threshold and Ease of Excitation (Smolewska et al., 2006). Some of the correlations related to mental health wellness and symptomology include self-perceived stress (Benham, 2006), anxiety and depression

(Bakker & Moulding, 2012; Liss et al., 2008), avoidant personality disorder (Meyer & Carver, 2000), and autism spectrum disorder (ASD; E. Aaron, 2015; Liss et al., 2008).

Researchers' findings highlight the importance of identifying SPS phenomenon in preschool age children. First, researchers provide a rationale for why helping professionals may misdiagnose children with SPS with a mental health disorder, showing a need for an instrument to assist in differentiation (Aron, 2015; Sangster et al., 2014). Second, previous findings allowed the current researcher to use scales that measure similar traits to the developed scale and establish discriminant and convergent validity (i.e., a form of construct validity) for the development of the HSPS. Based on the research, both the ATEC and PAS-R could contribute to the knowledge gleaned from the data analysis of the HSPS. Prior to discussing the scales used for understanding construct validity, the researcher first reviewed the literature related to the developed scale, HSPS.

Highly Sensitive Preschool Scale

The main goal of the HSPS is to identify, through caregiver report, children (ages 3-5 years old), who experience stronger neurological and emotional responses to surrounding and experienced stimuli (Pluess et al., 2018). Because researchers have identified an established 20% of the population to have the trait (Aron & Aron, 1997; Aron et al., 2012; Pluess et al., 2018; Aron, 2015; Smith, Sriken, & Erford, 2019), the current researcher was not selective of participants to achieve the bell curve of answers. Currently, assessments exist for individuals 18 and older, the Highly Sensitive Person Scale (HSPS; Aron & Aron, 1997) and for children 8-18 years old, the Highly Sensitive Child Scale (HSCS; Pluess et al., 2018). To develop items used in the HSPS, the researcher referenced the Highly Sensitive Child 12-item scale (Pluess et al.2018), the unpublished Dutch 38-item sensitivity scale for school-age children (Walda, 2007), and the

Child Behavior Checklist (CBCL; Achenbach & Rescorla, 2000). Finally, the researcher considered previous factor models of the HSPS (Aron & Aron, 1997) and HSCS (Pluess et al., 2018) as foundational scholarship to inform the current researcher in the development of items, before she presented items to the expert panel. Most researchers found two- and three-factor models (e.g., Booth et al., 2015; Evans & Rothbart, 2008; Pluess et al., 2018; Smolewska et al., 2006; Sobocko & Zelenski, 2015). Specifically, factor labels from the two-factor model include: (a) negative emotionality [NE; expressed distress in response to stimulation and experienced sensory discomfort] and (b) orienting sensitivity [OS; innate response to focus on both external and internal events] (Evans & Rothbart, 2008). The three-factor model includes (a) ease of excitation [EOE; i.e., ease of overstimulation in response to both internal and external demands], (b) aesthetic sensitivity [AES; i.e. appreciation and/or the ability to be moved/inspired by the arts], and (c) low sensitivity threshold [LST; unpleasant arousal to external stimuli such as loud noises] (Booth et al., 2015; Pluess et al., 2018; Smolewska et al., 2006; Sobocko & Zelenski, 2015). Due to inconsistent results across studies, poor reliability of overall scale and subscales, and poor model fit, the current researcher conducted an exploratory factor analysis to see if she would find similar factors in a new population of caregivers who had a preschool age child or if additional factors emerged (Booth et al., 2015; Evans & Rothbart, 2008; Montoya-Pérez et al., 2019; Pluess et al., 2018; Smith et al., 2019; Smolewska et al., 2006; Sobocko & Zelenski, 2015). Finally, to conduct an EFA, the researcher developed the initial HSPS, an 80-item assessment to measure SPS in preschool age children.

Autism Treatment Evaluation Checklist

The Autism Treatment Evaluation Checklist (ATEC; Rimland & Edelson, 1999) is a 77-item instrument to measure caregiver perception of autism in children one year and five months to 12 years and five months old (e.g., Charman et al., 2005; Coben & Padolsky, 2007; Jarusiewcz, 2002; Meiri et al., 2009). The ATEC, a four-point Likert scale, is comprised of four subscales including: (a) Speech/Language/Communication (14 items), (b) Sociability (20 items), (c) Sensory/Cognitive Awareness (18 items), and (d) Health/Physical/Behavior (25 items; Rimland & Edelson, 1999). The total score is the sum of the four subscale scores and can range from 0-180. A higher score translates to an increased severity of autism symptomology (Rimland & Edelson, 1999). More specifically, Mahapatra and colleagues (2020) conducted a longitudinal epidemiological study of autism and determined the following ranges within the identified total scores for the ATEC: (a) mild (20-49), (b) moderate (50-79), (c) severe (80-180).

Magiati and colleagues (2011) found ATEC on a small sample of children (n = 22) to have a high internal consistency for total scores between 0.91 and 0.96 and subscale scores between 0.86 and 0.94, using longitudinal data. These findings are similar to the internal consistency found at baseline for a large sample of children (n = 1,300), wherein the researchers conducted a split-half reliability test and found a high internal consistency reliability for both total (α = 0.94) and subscale scores (αs = 0.81-0.92; Rimland and Edelson, 2005). Furthermore, Magiati and colleagues (2011) found that ATEC total scores predicated 64% of the variance, a modest level of variance explained for a model (Mvududu & Sink, 2013). In addition, researchers considered convergent validity across two time points and found the ATEC Communication subscale score was highly correlated with the Autism Diagnostic Interview-Revised (ADI-R) non-verbal communication raw scores, Vineland Communication age equivalent scores, British Picture Vocabulary Scale (BPVS), and Expressive One-Word Picture Vocabulary Test (EOWPV) with r scores ranging from 0.77 to −0.92, $p < 0.001$ (Magiati et al., 2011). Researchers also found the Sensory/Cognitive subscale score was highly correlated with mental age (MA), determined through a developmental assessment with r scores ranging from -0.63 to 0.71, $p < 0.001$. Next, researchers found the Health/Physical/Behavior subscale score to be significantly correlated with Vineland Adaptive Behavior Scales (VABS) maladaptive behavior raw scores with an r score of 0.74, $p < 0.001$ (Magiati et al., 2011). Researchers considered the test-retest reliability and found that in a sample of two to six years-old ($N = 42$), the correlation coefficient was high at $r = 0.90$, $p < 0.001$ for both total ATEC score as well as all subscales (Freire, & André, 2018). Finally, researchers have not yet established construct validity using factor analysis for the ATEC; therefore, the researcher will conduct a CFA to determine factor structure with the caregivers of preschool age children prior to conducting a Pearson product-moment correlation with the HSPS (Mahapatra et al. 2020).

Preschool Anxiety Scale – Parent Report

The Preschool Anxiety Scale (PAS) is a five-factor model developed by Spence and colleagues (2001), consists of 29-items. The first 28-items asks parents to report the frequency of each item on a 5-point scale from 0 'not at all' to 4 'very often'. The last item asks parents if their child has experienced a traumatic event (yes/no); if yes, the parent is allotted space to note the type of trauma. If the child has experienced a traumatic event, then the parent is asked to answer an additional 5-items regarding post-traumatic stress disorder (PTSD) symptoms, using the same 5-point scale used for the first 28 items. Spence and colleagues' (2001) main aim of the PAS is to identify anxiety symptomatology in preschool age children. While the researchers did not design the instrument to be a diagnostic tool, they encourage helping professionals to compare means of their clients to the sample of preschool age children ($n = 1{,}368$) in their study. Furthermore, if a total or subscale score exceeds the means identified in the original data by one standard deviation or more, the researchers encourage the helping professional to refer the child for further testing. Considering internal consistency, researchers used a sample of caregivers with preschool age children (*N* = 1,138), with the majority being mother's report (*n* = 755, 66%; Spence et al., 2001). Using the mother's report (*n* = 755), the researcher used an exploratory factor analysis with a 28-item pool. Furthermore, the researchers used a scree test which indicated a four to five factor structure. Using oblimin factor rotation, the researchers determined a four-factor structure accounting for 46.8% of the variance, an variance explained approaching the acceptable 50% cutoff for social sciences (Roberts and Henson, 2006). The researchers then created a five-factor modeling forcing each item to load uniquely to the theorized associated factor wherein the CFI > .90, and the SRMR and RMSEA were both < .05. When the researchers compared five-factor model to the four-factor model, the change in the X^2 statistic indicated a better fit of the data in the five-factor model. The five-factor model, with each corresponding factor-loading, include (a) generalized anxiety (r = .90), (b) social anxiety (r = .64), (c) obsessive-compulsive (r = .78), (d) physical injury fears (r = .78), and (e) separation anxiety (r = .94). Subsequently, the researcher used the father reports (*n* = 383) to conduct a confirmatory factor analysis (CFA) and found similar results demonstrating that a five-factor model best fit the data with a CFI > .90 and both an RMSEA and SRMR ≤ .05. Finally, the researchers found a strong internal consistency reliability for the PAS total score r = .95.

Spence and colleagues (2001) assessed convergent and divergent validity using the Pearson product-moment correlation to assess the relationship between the PAS total score with both the internalizing and externalizing subscales of the *Child Behavior Checklist* (CBCL; Achenbach & Rescorla, 2000, 2001). In general, the researchers found a strong positive correlation between the PAS and the internalizing subscale (r = .68, p < .001) and a statistically significant yet much weaker correlation between PAS and the externalizing subscale (r = .27, p <

.001). Finally, researchers found the correlational analysis between the trauma subscale of the PAS and observed frequency of PTSD symptoms was not statistically significant, concluding the lack of significance was due to the low prevalence of experienced traumatic events (65 children, 13.6%) and even lower prevalence of PTSD symptoms unspecified by the researchers. Scheeringa and colleagues (2003) corroborated this finding, wherein 62 traumatized children ranging from 20 months to six years of age, did not meet the criteria for PTSD. Finally, to establish construct validity with the current sample population, the researcher ran a CFA to determine factor structure with the caregivers of preschool age children prior to conducting a Pearson product-moment correlation with the HSPS-P (Mahapatra et al. 2020).

Demographic Form

The researcher created a demographic form to gain information regarding the child including (a) age, (b) gender, (c) ethnicity, (d) birth order (i.e., oldest, middle, youngest), (e) hours of screen time, (f) height, (g) weight, and (h) type of schooling (i.e., public, private, or homeschool). Additionally, the researcher included information regarding the caregiver including (a) age and (b) gender, (c) race, (d) ethnicity, (e) education, (f) yearly salary, (g) employment status, (h) general demographic location of home, and (i) understanding and acceptance of child’s behaviors.

Purpose and Research Questions

The purpose of this research study was to design an instrument to measure sensory processing sensitivity in young children based on caregiver report. The specific research questions investigated included the following:

Research Question 1

What is the factor structure of the items on the HSPS with a sample of primary caregivers of children 3-5 years-old?

Research Question 2

What is the internal consistency reliability of the HSPS with a sample of primary caregivers of children 3-5 years-old?

Research Question 3

What is the relationship between HSPS scores and PAS-R and ATEC scores with a sample of primary caregivers of children 3-5 years-old (examining the convergent and discriminant validity of the HSPS)?

Research Question 4

What are the relationships between HSPS scores and reported demographic data?

Research Question 5

What is the test-retest reliability of the HSPS with a sample of primary caregivers of children 3-5 years-old?

Assessing Psychometric Properties and Statistical Analysis

To address research question one, the researcher conducted an Exploratory Factor Analysis (EFA), using stringent guidelines outlined by both DeVellis (2017) and Dimitrov (2012). The researcher referenced previous scales and expert opinions to theorize items in the scale. Based on feedback provided by the expert panel, the researcher deleted, adjusted, or added items within the scale (DeVellis, 2017; Dimitrov, 2012). At the end of the process, the researcher finalized the HSPS with 80 items. The researcher used Kaiser-greater-than-one, scree plot, and

ML to determine the factor structure of the HSPS. Details on this process are outlined above in *Step 1 Determine the Characteristics of Sensory Processing Sensitivity* through *Step 8 Optimize Scale Length*.

To address research question two, the researcher used the *Statistical Package for Social Science* (SPSS; version 27.0) to analyze the internal consistency reliability by examining the value of Cronbach's Alpha. The analysis determined how reliable the set of items were within the HSPS. Considering reliability or internal consistency, the researcher attained an acceptable level of internal reliability (α = .744), close to the optimal score between .80 and .90 (Hahs-Vaughn, 2017).

To address research question three, the researcher investigated the relationship between the HSPS subscales and total scores with both the ATEC and the PAS scores. Grounded in theoretical assumptions, the researcher hypothesized the HSPS total score to have a moderate to strong correlation with (a) ATEC subscale, Sensory/Cognitive Awareness, (b) PAS subscale Generalized Anxiety, and (c) PAS subscale Social Anxiety. To assess the relationship between the variables, the researcher evaluated the data from the three measures (i.e., HSPS, ATEC, and PAS) using Spearman rho correlations. When analyzing correlations, Ferguson (2016) suggested that, within social science data, the minimum effect size to be 0.2, 0.5 as moderate effect size, and 0.8 as a strong effect size.

To address research question four, the researcher considered the relationship between HSPS item and total scores with reported demographic data. Next, the researcher used differential item functioning (DIF) to determine the presence of bias across any items in the HSPS, based on demographic variables (Martinková et al., 2017). The most common methods of DIF include: (a) the Mantel-Haenzel procedure (Holland and Thayer, 1988), and (b) the logistic regression procedure (Swaminathan & Rogers, 1990). Each type of methodology analyzes different types of data (i.e., nominal, ordinal, interval, and ratio). While the Mantel-Haenzel procedure is restricted to nominal data, the logistic regression procedure allows for the use of ordinal and nominal data. Because the researcher used multiple types of data beyond nominal and ordinal, she conducted a one-way multivariate analysis (MANOVA), allowing for all types of data. Additionally, by using a one-way MANOVA, the researcher was able to detect any relationship between each item used in the final HSPS model and reported demographic data *and* determine the intersectionality of participants. Finally, the p value must be statistically significant at $\leq .05$ to demonstrate significance between the HSPS and demographic variables (Hahs-Vaughn, 2017).

Finally, to address research question five, the researcher administered the HSPS twice to a self-selected sample across a two-week time frame to (a) examine test-retest reliability, (b) assess if the highly sensitive trait remains constant over time, and (c) identify if error exists in the stability of the developed HSPS scale using Pearson product-moment correlation. Finally, the researcher considered values near (a) +1.0 and -1.0 to be strong correlations, (b) +.50 and -.50 to be moderate correlations, and (c) 0 to be weak correlations (Hahs-Vaughn, 2017).

Reliability

An instrument must be reliable to be valid (Reynold, Livingston, & Wilson, 2009). Furthermore, reliability is the researcher's ability to consistently attain scores from a sample not impacted by instrument error (i.e., variance not accounted for; Reynold, Livingston, & Wilson, 2009). With consistently increased accuracy and decreased measurement error, a higher level of reliability is present (DeVellis, 2017, Dimitrov, 2012). Finally, to measure reliability, the researcher assessed for internal consistency, using Cronbach's alpha and inter-item correlation (Kline, 2016). Specifically, the researcher assessed which caregiver responses were consistent across the items of HSPS (Kline, 2016).

Internal Consistency

Researchers use Cronbach's coefficient alpha (1951) to assess internal consistency (Kline, 2016). Furthermore, the method of analysis is designed to verify if items within an instrument are consistently measuring the phenomenon being studied (i.e., sensitivity; Kline 2016). Additionally, Cronbach's alpha is one of the most common forms of determining reliability of items within an instrument (Streiner, 2003). The limitation of this type of analysis occurs when the researcher has a large item pool (i.e., 1,000 or more items), resulting in an inflated correlation value (Kline, 2016; Streiner, 2003). To address the limitation of Cronbach's alpha, Kline (2016) suggested the use of split-half reliability, wherein a single-test is divided into two group scores, which are then correlated. This process of split-half reliability addresses the shortcoming of Cronbach's alpha through a more precise estimate, correcting the correlation score for test length (Kline, 2016). Based on the developed item pool (80 items), the researcher used Cronbach's alpha (1951) to assess the reliability of items in the HSPS measuring SPS. Specifically, the researcher aimed to achieve an alpha level between .70 and .90, indicating an adequate level of reliability without redundancy across items (Kline, 2016; Streiner, 2003). Finally, due to the early stages of instrument development, the researcher sought to attain a whole-scale reliability of around .70 (Nunnally, 1978).

Inter-Item Correlation

Researchers use inter-item correlation matrices to assess the homogeneity and reduce redundancy across items of a phenomenon or construct (Piedmont & Hyland, 1993). Using inter-item correlation frequency analysis, researchers assess the distribution of inter-item correlations across items. Researchers have determined that a correlational frequency of .2 to .4 is needed to show that the latent variables are all measuring a single phenomenon (Piedmont & Hyland, 1993). Conversely, less than or greater than the optimal frequency implies lack of measurement of the phenomenon or too much redundancy across latent variables, respectively (Piedmont & Hyland, 1993). Finally, Finch (2020) reminded researchers that while considering observed data is important, one must not forget to also consider the theoretical tenants, related to the inter-factor correlation matrix. In conclusion, the researcher sought a mean inter-item correlation of .2 to .4 while also considering if theoretical underpinnings support the correlations within the matrix.

Validity

Validity is an assessment or judgment of whether an instrument is measuring the identified phenomenon or construct (DeVellis, 2017; Dimitrov, 2012). When reporting validity, researchers are not reporting on the instrument but instead are referring to an interpretation of the outcome measures in a particular context and with a particular population (Cronbach, 1971). Historically, three general approaches exist to measure validity including: (a) criterion-based model (Cronbach and Gleser, 1965), (b) construct-based model (Cronbach & Meel, 1955), and (c) unified construct-based model (Messick, 1989, 1995). The first two models have a limited scope, lacking a comprehensive view of validity and are solely dependent of empirical evidence (Dimitrov, 2012). Furthermore, researchers tend to refer to multiple, distinct "types" of validity, included in the first two models (i.e., content validity, criterion validity, and construct validity), as comparable. Using these models of validity, researchers run the risk of attaining one type of validity while minimizing or ignoring other types of validity, misrepresenting the overall validity of an instrument (Dimitrov, 2012). Most commonly, when researchers focus on one type of validity, they typically emphasize internal validity at the expense of other types of validity. Finally, researchers use the more contemporary validity model, unified construct-based model, to consider both empirical evidence and the theoretical underpinnings supporting the interpretations of outcomes (Messick, 1989). Supporting Messick's (1989) challenge to expand the view of validity within the social sciences, the American Education Research Association (AERA), along with the American Psychological Association (APA) and the National Council of Measurement in Education (NCME; 1999) defined validity as, "the degree to which all the accumulated evidence supports the intended interpretation of the test scores for the proposed purpose" (p. 11). Because of the identified shortcomings of focusing on a few types of validity, the researcher evaluated the validity using four of the five *Standards for Educational and Psychological Testing* (AERA, APA, & NCME, 1999, 2014): (a) test content, (b) some aspects of response process, (c) internal structure, and (d) relationship to other variables. The fifth category of validity, consequences of testing, where researchers consider the intended and unintended consequences of interpreting outcomes of the developed instrument, occurs after the study is complete. Therefore, the researcher plans to conduct consequences of testing with a new sample population in future longitudinal research. AERA, APA, and NCME's (1999, 2014) development of broad areas of validity address the limitations of Cronbach's (1954) condensed conceptualization of validity.

Evidence Based on Test Content

To establish evidence based on test content, the researcher considered all test content including items, tasks participants must undertake, format of the instrument, and wording of the instrument (Goodwin and Leach, 2003). In addressing test content validity, the researcher conducted a thorough review of the literature to assess established research concerning sensitivity in both children and adults. Secondly, the researcher followed rigorous steps in creating the item pool using (a) repetition within items (DeVellis, 2017), (b) language at or below 5th grade reading level (Watson et al., 1978), (c) a balance of positive and negative statements (DeVellis, 2017; Willits, Theodori, & Luloff, 2016), and (d) inclusion of an expert panel to review and critique HSPS items. Additionally, the researcher evaluated the strengths and shortcomings of different types of Likert scales to decide which would best meet the purposes of the HSPS to identify SPS in preschool age children using caregiver-report. Finally, the researcher conducted an exploratory factor analysis assessing and determining the internal structure of the model.

Evidence Based on Response Process

To establish evidence based on response process, the researcher assessed if caregivers, who filled out the HSPS, followed the task as she intended (Goodwin and Leach, 2003). To strengthen the evidence for the intended process, the researcher had the expert panel review the instructions given to caregivers to assess ease of understanding. Additionally, the researcher made the assessment accessible through Protege, a website, social media ads, and email, providing complete anonymity, decreasing bias secondary to the researcher-participant interaction (Gerlich, Drumheller, Clark, & Baskin, 2018). Finally, the researcher conducted an analysis of Differential Item Functioning (DIF; Goodwin and Leach, 2003) to assess the possibility of response bias based on collected demographic information (i.e., age, gender, or ethnicity). Using DIF, the researcher determined the intersectionality of demographic factors related to how caregivers answered the items on the HSPS. The researcher provided an analysis of the DIF in Chapter 4, *Results*.

Evidence Based on Internal Structure

To establish evidence based on internal structure, the researcher conducted a factorial analysis to assess how well items represented the phenomenon SPS (Goodwin and Leach, 2003). Specifically, the researcher used an EFA to examine correlations within and among the sub-scales, assessing the relationships within latent variables, subscales, and the phenomenon of sensitivity.

Evidence Based on Relationship to other Variables

To establish evidence based on relationship to other variables, the researcher determined if these relationships provide evidence of similarities and differences between HSPS and other instruments (Goodwin & Leach, 2003). To assess construct validity, the researcher considered both convergent (highly correlated scales/items) and divergent validity (low correlated scales/items) when evaluating the correlations between HSPS total and subscales with the total and subscales of both ATEC and PAS. The researcher selected the ATEC and PAS due to the overlap in symptomology between these constructs (Aron, 2015; Smith et al., 2019). Based on the literature, the researcher hypothesized a small to moderate correlation between HSPS and ATEC, and HSPS and PAS due to the small overlap in symptomology (for more specifics see section *Assessing Psychometric Properties and Statistical Analysis*).

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Ethical Considerations

In the present study, the researcher followed ethical guidelines outlined by the University of Central Florida's IRB. First, the researcher attained IRB approval prior to initiating the study or collecting data. As included in the IRB, the researcher obtained consent and shared the purpose of the study with each caregiver, through an approved form letter, prior to participating in the study. The researcher informed *all* participants that participation in the study would be strictly voluntary through the written informed consent. Furthermore, the researcher obtained *all* participants' information confidentially, wherein the researcher did not link the one piece of identifying information (email address for sending out the second survey) with the participants information. Due to the current stressful events children were enduring, the researcher provided resources on how to support children with SPS on the developed website. Finally, the researcher kept data in a locked office and on a password protected computer.

Summary

In conclusion, the research purpose for this investigation was to develop the HSPS and assess the psychometric properties of the HSPS in a sample of caregivers with preschool age children. In chapter three, the researcher presented (a) research design, (b) population and sampling procedures, (d) instrument development procedures, (e) instrumentation, (f) purpose and research questions, (g) statistical analysis she will use when assessing psychometric properties of HSPS, (h) ethical considerations, and (i) limitations. The researcher will present the results of the research study in Chapter 4.

CHAPTER FOUR: RESULTS

In chapter four, the researcher presented the results of the data analysis to answer the established research questions from chapter three. Overall, the researcher explored the factor structure and psychometric properties of the HSPS with a sample of caregivers reporting their perceptions regarding behaviors related to sensitivity in their preschool age child. The researcher analyzed data for using (a) *Statistical Package for Social Science* (SPSS; version 27.0) for the EFA analysis, Pearson product-moment correlation, multiple linear regression, and coefficient stability; (b) *R System for Statistical Computing* (RStudio Desktop, Version 1.4.1106) *and its* MICE (e.g., an acronym for multivariate imputations by chained equations) package (Version 3.8.0) used to address missing data; and (c) *Statistical Analysis System* (SAS; version 9.4) to conduct confirmatory factor analysis (CFA) for both the PAS and ATEC. In chapter four, the researcher presented descriptive statistics for both caregivers and preschool age children, followed by analysis of assumptions and results for each research question. The researcher utilized the following analyses based on each research question: (a) research question one, EFA, (b) research question two, Cronbach's alpha and inter-item correlation, (c) research question three, Spearman rho correlations, (d) research question four, one-way multiple linear regression (MANCOVA/MANOVA), and (e) research question five, Pearson product-moment correlations.

Sampling and Data Collection Procedures

The target population for the study was primary caregivers of preschool age children (3-5 years old). The researcher used a convenience sampling method with the following inclusion criteria: caregivers (a) who were 18 years of age or older, (b) who had one child 3 to 5 years of age exhibiting neurotypical development with no current diagnosed developmental delays, (c) who were considered the primary caregiver of the child, (d) whose child primarily lived in their residence, and (e) who could read proficiently in English. The researcher recruited participants by (a) reaching out to leadership in established organizations working with preschool age children, (b) distributing targeted ads through social media platforms to organizations/groups providing support to caregivers of preschool age children (Gall et al., 2007), and (c) using the online panel data company Protege (Walter, Seibert, Goering, & O'Boyle, 2019). Due to pandemic restrictions, all data collection procedures included online contact and administration of the survey packet. The researcher collected data from February 1, 2021, to March 31, 2021. The researcher presented further details related to sampling and data collection in Chapter Three.

Response Rates

The researcher calculated the response rate based on both the total number of participants (*n* = 1,048) and the data source (e.g., Online vs. Data Research Panel). Additionally, the researcher presented a summary of the details for both response and usable response rates below in Table 2.

Table 2.

Response and Completion Rates for the HSPS

Data Source	Website Visits	Social Media	Personal Emails	Participant Responses (*n*)	Response Rate (%)	Quality Checks	Did not Qualify	Opted Out	Dropouts	Usable Response (*N*)	Usable Response Rate
Online	358	21	19	266	66.83 %	--	--	--	97	168	42.21 %
Data Research Panel	--	--	--	880	--	103	254	24	90	409	46.48 %
Total				1,146	--					577	50.35 %

Note. Table represents participants who completed the HSPS.

Total Sample. The researcher began with a total usable sample of 577 wherein all participants started and completed the HSPS. Therefore, the combined usable response rate for RQs 1-2 was N = 577, 50.35% (see Table 2).

Online Recruitment. For online recruitment, the researcher invited 398 participants through the developed website (n = 358), social media invitations (n = 21), and personal emails (n = 19). Of the 398 participants invited, 266 started the HSPS (66.83% response rate). Of those participants, 97 individuals did not complete the HSPS, ending up with a usable response rate of 42.21%.

Data Research Panel Recruitment. For the data research panel, the researcher was not able to access the number of individuals invited to fill out the survey, as this process was done through the research company. Because the researcher was only aware of the number of participants who started the survey, the overall response rate was unknown. However, the researcher calculated the useable response rate from those who responded to the research invitation and started the survey (n = 880). The researcher calculated a usable response rate of 46.48% (n = 409). Participants were removed from the study for several reasons: not qualifying for the study (n = 254), quality check removals by the research company (n = 103), opting to not participate/complete (n = 24), or dropping out (n = 90). The researcher discussed details related to quality checks in *Non-Response Error* in Chapter 3.

Response Rate for the Test-Retest. Additionally, the researcher calculated the response rate for research question five, using a subsample from the online recruitment (see Table 2). Specifically, in the online recruitment portal, the researcher asked all participants to provide their email during the first survey to receive the second survey two weeks later. Of 168 participants who were invited, 134 provided their email for a response rate of 79.76%. Of the 134 who provided an email address, 97 completed the survey for a usable response rate of 57.74% (N = 97).

Table 2.

Response and Completion Rates for the Test-Retest

Data Source	Participants Invited	Participant Responses (n)	Response Rate	Dropouts	Usable Response (N)	Usable Response Rate
Online	168	134	79.76%	37	97	57.74%
Total		134	79.76%		97	57.74%

Participant Demographics Information

The researcher analyzed participant demographics on the total sample (n = 577). Demographic information for caregivers and children is presented below.

Caregiver Demographic Information. Within the sample, approximately 78.7% of caregivers identified as female (n = 454), 21.3% identified as male (n = 123), and 0% identified as non-binary or transgender (n = 0). About 82.3% of the population identified as Non-Hispanic or Latino (n = 472), while 18.2% identified as Hispanic or Latino (n = 105). Within the Non-Hispanic or Latino subgroup, 76.5% identified as Caucasian (n = 359), 7% as Black or African American (n = 33), 10.7% as Asian (n = 50), 3.8% as American Indian/Alaskan Native (n = 18), 0.4% as Native Hawaiian/Pacific Islander (n = 2), 1.3% as Multiracial (n = 6), and 0.2% as Other (n = 1). Within the Hispanic or Latino subgroup, 64.8% identified as Caucasian (n = 68), 3.8% as Black or African American (n = 4), 1% as Asian (n = 1), 1% as American Indian/Alaskan Native (n = 1), 14.3% as Multiracial (n = 15), and 15.2% as Other (n = 16).

Participants' ages ranged from 21 to 71 years old with a mean age of 35.97 years (*SD* = 7.40). Participants educational levels ranged from No Degree or Diploma at 1.7% (n = 10) to having a Masters' degree or Advanced Degree at 29.6% (n = 171), with a yearly income that ranged from < $30,000 at 12.3% ($n$ = 71) to > $75,000 at 51.6% ($n$ = 298). Finally, participants primarily reported residing in areas within the United States at 96.5% (n = 558), while 3.1% reported living outside of the United States (n = 18). Refer to Table 3 for detailed information on caregiver demographics.

Table 3.

Caregiver Demographics

Characteristic	EFA Sample		Test-Retest Subsample	
	n	Total %	*n*	Total %
Gender Identity				
Female	454	78.7	95	97.9
Male	123	21.3	2	2.1
Race/Ethnicity				
Non-Hispanic or Latino	472	82.3	94	96.9
White	359	76.5	91	96.8
Black/African American	33	7.0	1	1.0
Asian	50	10.7	--	--
American Indian/Alaskan Native	18	3.8	--	--
Native Hawaiian/Pacific Islander	2	0.4	--	--
Multiracial	6	1.3	2	2.1
Other	1	0.2	--	--
Hispanic or Latino	105	18.2	3	3.1
White	68	64.8	3	100

Characteristic	EFA Sample		Test-Retest Subsample	
	n	Total %	*n*	Total %
Black/African American	4	3.8	--	--
Asian	1	1.0	--	--
American Indian/Alaska Native	1	1.0	--	--
Multiracial	15	14.3	--	--
Other	16	15.2	--	--
Age				
21-25	23	4.01	3	3.01
26-30	59	10.3	5	4.1
31-35	211	36.8	44	45.3
36-40	175	30.5	36	37.0
41-45	64	11.2	9	9.3
46-50	20	3.5	--	--
> 51	21	3.7	--	--
Educational Level				
No Degree or Diploma	10	1.7	1	1.0
High school diploma/GED	112	19.4	3	3.1
Vocational/Technical Certification	25	4.3	2	2.1
Associates Degree	58	10.1	3	3.1
Bachelors degree	201	34.8	40	41.2
Masters degree/Advanced Degree	171	29.6	49	50.5
Yearly Income				
< $30,000	71	12.3	5	5.2
$30,000 - $60,000	140	24.3	7	7.2
$61,000 - $75,000	66	11.4	8	8.2
> $75,000	298	51.6	76	78.4

Characteristic	EFA Sample		Test-Retest Subsample	
	n	Total %	*n*	Total %
Country				
United States	558	96.5	88	90.7
North	8	1.4	1	1.0
Northeast	122	21.1	21	21.6
Southeast	79	13.7	26	26.8
Northwest	18	3.1	--	--
Southwest	6	1.0	--	--
West	92	15.9	8	8.2
Midwest	123	21.3	21	21.6
Hawaii	2	0.3	--	--
Canada	7	1.2	2	2.1
Europe	9	1.6	4	4.2
Asia	2	0.3	1	1.0

Comparison with the US Census. Next, the researcher compared demographic distribution of data to the US Census (2019) and found reasonable comparisons. Considering gender representation, within the US Census (2019) 50.8% identified as female compared to 78.7% among participants. Looking at ethnicity within the US Census (2019), 18.5% of the population identified as Hispanic or Latino whereas 18.2% of the participants in the study identified as Hispanic or Latino. The researchers found similar outcomes for race between the US Census (2019) and the demographic data: (a) Caucasian 76.3% (US Census, 2019) compared to 74%, (b) Black or African American 13.4% (US Census, 2019) compared to 6.4% (c) Asian 5.9% (US Census, 2019) compared to 10.7%, (d) Native Hawaiian/Pacific Islander 0.2% (US

Census, 2019) compared to 0.34%, and (e) Multiracial 2.8% (US Census, 2019) compared to 3.6%. Based on these results, the researcher concluded that the demographic data, while at times limited, was comparative to the US Census (2019) statistics. Additionally, while percentages were comparable, the researcher could not determine statistical and practical significance across some demographics due to small sample size (e.g., Native Hawaiian/Pacific n = 2).

The researcher then compared education level between the US Census (2019) and demographic data. The researcher found those who held: (a) a high school diploma or equivalent, a Vocational Certificate, or an Associate degree consisted of 88% of the population (US Census, 2019) compared to 34% in the sample; whereas participants who held a Bachelors or Advanced degree consisting of 32.1% (US Census, 2019) compared to 64.5% in the sample. Finally, the researcher compared household income between the US Census (2019) and the current sample, finding that individuals below the poverty line (making approximately less than $30,000 annually) were comparable (10.5%, US Census, 2019; 12.3%, sample population); whereas the total sample's median income differed ($62,000, US Census, 2019; at or above $75,000, sample population).

Therefore, the researcher concluded that the sample population mirrored general data from the US Census across race and ethnicity, while other demographic categories (e.g., gender, income, and education) represented more privilege than what was found in the general US Census (2019) data. Furthermore, even when percentages were comparable, the researcher recognized the limitation of representation and generalizability of outcome data due to smaller sample sizes. Finally, the researcher acknowledged a small representation of participants was not from the US (n = 18). Therefore, the researcher found it difficult to explain how each of these individuals impacted the percentages represented across demographics.

Caregiver Demographic Information for Test-Retest. Within the test-retest sample, approximately 97.9% of caregivers identified as female (*n* = 95), while 2.1%, identified as male (*n* = 2). About 82.3% of the population identified as Non-Hispanic or Latino (*n* = 472), while 18.2% identified as Hispanic or Latino (*n* = 105). Within the Non-Hispanic or Latino subgroup, 96.8% identified as Caucasian (*n* = 91), 1% as Black or African American (*n* = 1), and 2.1% as Multiracial (*n* = 2). Within the Hispanic or Latino subgroup, 100% identified as Caucasian (*n* = 3). Participants' ages ranged from 21 to 45 years old with a mean age of 35 years (*SD* = 5.12). Participants educational levels ranged from having a high school diploma / GED at 3.1% (*n* = 3) to having a Masters' degree or Advanced Degree at 50.5% (*n* = 49), with a yearly income that ranged from < $30,000 at 5.2% (*n* = 5) to > $75,000 at 78.4% (*n* = 76). Finally, participants primarily reported residing in areas within the United States at 90.7% (*n* = 88), while 7.3% reported living outside of the United States (*n* = 7). Refer to Table 3 for detailed information on caregiver demographics for the test-retest. Finally, compared to the larger demographic makeup, the subpopulation, who participated in the test-retest, presented a much higher proportion of privileged individuals across ethnicity, race, income, and education. The researcher noted the comparisons in Table 3.

Child Demographic Information. Regarding child demographics, approximately 49% of caregivers identified their preschool age child as female (*n* = 283), 51%, identified their child as male (*n* =294), and 0% identified their child as non-binary or transgender (*n* = 0). About 80.4% of the population identified their child as Non-Hispanic or Latino (*n* = 464), while 18.9% identified as Hispanic or Latino (*n* = 109). Within the Non-Hispanic or Latino subgroup, 71.9% identified as Caucasian (*n* = 337), 7.7% as Black or African American (*n* = 36), 10.2% as Asian (*n* = 48), 2.6% as American Indian/Alaskan Native (*n* = 12), 7.2% as Multiracial (*n* = 34), and

0.4% as Other (n = 2). Within the Hispanic or Latino subgroup, 63.8% identified as Caucasian (n = 67), 3.8% as Black or African American (n = 4), 1% as Asian (n = 1), 1.9% as American Indian/Alaskan Native (n = 2), 23.8% as Multiracial (n = 25), and 5.7% as Other (n = 6). Participants' ages ranged from 3 to 5 years-old with a mean age of 3.93 years (SD = 0.800). Refer to Table 4 for detailed information on child demographics.

Table 4.

Child Demographics

Characteristic	EFA Sample		Test-Retest Subsample	
	n	Total %	*n*	Total %
Gender Identity				
Female	283	49.0	53	54.6
Male	294	51.0	44	45.4
Race/Ethnicity				
Non-Hispanic or Latino	464	80.4	90	92.8
White	337	71.9	81	83.5
Black/African American	36	7.7	3	3.1
Asian	48	10.2	--	--
American Indian/Alaskan Native	12	2.6	--	--
Native Hawaiian/Pacific Islander	--	--	--	--
Multiracial	34	7.2	7	7.7
Other	2	0.4	--	--
Hispanic or Latino	109	18.9	6	6.2
White	67	63.8	2	2.1
Black/African American	4	3.8	--	--
Asian	1	1.0	--	--

Characteristic		EFA Sample		Test-Retest Subsample	
		n	Total %	*n*	Total %
	American Indian/Alaska Native	2	1.9	--	--
	Multiracial	25	23.8	2	2.1
	Other	6	5.7	2	2.1
Age					
3		207	35.9	43	44.3
4		205	35.5	38	39.2
5		165	28.6	16	16.5

Child Demographic Information for the Test-Retest. Regarding test-retest sample of child demographics, approximately 54.6% of caregivers identified their preschool age child as female (n = 53), while 45.4%, identified their child as male (n =44). About 92.8% of the population identified their child as Non-Hispanic or Latino (n = 90), while 6.2% identified as Hispanic or Latino (n = 6). Within the Non-Hispanic or Latino subgroup, 83.5% identified as Caucasian (n = 81), 3.1% as Black or African American (n = 3), and 7.2% as Multiracial (n = 7). Within the Hispanic or Latino subgroup, 33.3% identified as Caucasian (n = 2), 33.3% as Multiracial (n = 2), and 33.3% as Other (n = 2). Participants' ages ranged from 3 to 5 years-old with a mean age of 3.72 years (SD = 0.732). Refer to Table 4 for detailed information on child demographics.

Sample Size

An essential component, to making data cleaning successful, is executing a priori analyses to deduce optimal sample size, increasing the likelihood of achieving statistical and practical significance (Cohen, 1962, 1988, 1992; Osborne, 2013). Furthermore, Osborne (2013) stated that by calculating adequate sample size through a priori analyses, the researcher ensures optimal use of effort and resources. For the study, all the a priori analyses were included in *Chapter Three*. In summary, the researcher chose to use Hair and colleagues' (2019) recommendations of recruiting five individuals for every item in the initial HSPS. Due to having 80 initial items, prior to conducting the EFA analysis, the researcher needed a minimum of 400 participants.

Overall, the researcher started with the usable sample size as determined above (N = 577), and then used data cleaning to determine final sample size for each research question (RQ). For RQs 1-2 the researcher started with a total usable sample of N = 577 and removed five cases on the HSPS, based on standardized z cut off score of ± 3.0 (Osborne, 2013). After the researcher removed the univariate outliers, the final total sample for RQs 1-2 was N = 572 and exceeded the minimum (ns = 400 and 320) to conduct an EFA and internal consistency reliability on the HSPS. For RQ 3 the researcher again started with total useable sample of N = 577 and then ran tests of normality on the new 15-item four-factor HSPS model. Different than the previous 80-item scale, the researcher only identified a single case that exceeded standardized z cut off score of ± 3.0 (Osborne, 2013). Additionally, due to the model modifications of the both the PAS and ATEC (see *Confirmatory Factor Analysis* section), the researcher deleted an additional 18 cases that exceeded the standardized z cut off score of ± 3.0 (Osborne, 2013). The researcher's final sample size for RQ 3 was 558, exceeding the a priori analysis of needing 312 participants to conduct a Spearman rho correlation. For RQ 4 the researcher ran tests of normality on the new 15-item four-factor HSPS model and subscales, deleting a total of 11 cases that exceeded the standardized z cut off score of ± 3.0 (Osborne, 2013). After the deletion of cases, the final sample size for RQ 4 was 566 and exceeded the minimum to conduct a MANOVA ($n = 132$). Finally, for RQ 5, the researcher used the sample of 97 participants to run the Pearson product-moment correlation. Based on the a priori analysis, the researcher's sample of 97 participants was sufficient to run the test-retest analysis using a Pearson product-moment correlation.

Data Screening and Cleaning

Next, the researcher addressed missingness and potential values of bias within the data. To address these concerns, the researcher discussed (a) missing data analysis, (b) univariate and multivariate normality, (c) removal of cases with outliers and (d) reassessment of multivariate normality.

Missing Data Analysis

Missing data can become problematic, creating bias within statistical analyses (Osborne, 2013). Through a review of the descriptive statistics, the researcher verified the level of missingness across all assessments, finding 95 missing values for the online administration (email, social media ads, and website), accounting for 0.080% of the values, and no missing values for data from the research panel. The difference between missingness was because, unlike the data research panel survey, the online survey did not utilize the forced response option, allowing participants to skip over items. While missingness was present in the online sample, the percentage was well below the minimal proportion of missing data to total data (<5%; Tabachnick & Fidell, 2013), leading the researcher to be minimally concerned of bias. To examine if the data was missing completely at random (MCAR) or missing at random (MAR), the researcher conducted Little's MCAR test. Little's MCAR test functions as a simple t-test. The results of the analysis were statistically non-significant, $\chi 2(6509) = 4826.924$, $p = 1.000$, wherein the researcher concluded that data was missing indiscriminately (e.g., < 5%, Osborne, 2013).

Because values were missing indiscriminately, the researcher felt comfortable using multiple imputation with chained equations, which researchers most readily use for replacing missing values for EFAs (MICE; van Buuren, 2007). MICE is specialized, in that the procedure creates an independent equation for each missing value instead of using a general equation for all missing values. Specifically, the researcher used *R System for Statistical Computing,* MICE (e.g., an acronym for multivariate imputations by chained equations), a package for structural equation modeling (R; Version 3.5.2; R Development Core Team 2012), to replace the missing values across all three scales (HSPS, 11 values; PAS, 6 values; and ATEC, 78 values). Specifically, using MICE, the researcher created values using predictive mean matching. The researcher calculated five imputations and then considered which of the five made the most theoretical sense to apply to the scale in its entirety.

Finally, due to the nature of an EFA, the researcher wanted to ensure an absence of bias resulting from a pattern of missingness. Upon visual inspection of the missingness across items, the researcher had no concerns regarding the patterns of missingness. Additionally, from a theoretical standpoint, the researcher studied missingness and considered if items with missingness presented with patterns related to either demographic variables or content communalities (Osborne, 2013). Upon observation of items with missingness, the researcher did not find theoretical patterns related to item numbers concerning missingness. The researcher presented specifics on the missing values for the HSPS in Table 5.

Table 5.

Variable Summary of Missing Data for HSCSP

Item	Item Description	N	Percent	Valid N
S79	My child enjoys music.	1	0.6%	168
S63	When a character on tv is sad, my child looks sad.	1	0.6%	168
S62	Movies with violence do not upset my child.	3	1.8%	168
S54	My child enjoys trying new things.	1	0.6%	168
S35	My child rarely cries.	1	0.6%	168
S23	My child has big emotions.	1	0.6%	168
S14	My child asks a lot of questions.	1	0.6%	168
S7	If my child knows I am having a hard time, my child tries to comfort me.	1	0.6%	168
S6	My child feels sad when seeing someone else who is sad.	1	0.6%	168

Univariate and Multivariate Normality

The researcher assessed normality through graphical techniques and statistical analyses to determine if the assumption of normality was true or if data outcomes violated the assumption (Tabachnick & Fidell, 2013). Because tests of normality are subjective, researchers need to use multiple analysis to assess for the assumption of normality (Hahs-Vaughn, 2017). Furthermore, through the varying tests, both visual and statistical, the researcher assessed if removing cases with outliers would improve the assumption of normality. Specifically, the researcher determined if variables with extreme values (outliers) impacted outcome variables on the HSPS.

Outliers

An outlier is a case in which one or more data points produce extreme values compared to the data points near the median influencing the mean, standard deviation, and correlation coefficients (Lomax & Has-Vaughn, 2020). Outliers can occur due to (a) data miscalculations, (b) intentional or motivated misreporting, (c) sample error or bias, (d) standardization failure, (e) faulty distributional assumptions, or (f) legitimate cases sampled from the correct population (Osborne, 2013). Finally, due to the bias created by outliers, researchers must address the presence of outliers by explaining, deleting, or accommodating using robust statistics (Tabachnick & Fidell, 2013).

In determining the presence of univariate outliers for the exploratory factor analysis (EFA), the researcher converted standardized *z* scores of the HSPS and identified any values ± 3.0 (Osborne, 2013). Using the standardized *z* cut off score of ± 3.0 (Osborne, 2013), the researcher deemed five (0.01%) of total scale for HSPS. The researcher started with a useable sample of $N = 577$, then deleted five cases with identified univariate outliers bringing the final total sample size to $N = 572$. Furthermore, using the standardized *z* scores, the researcher identified no outliers across the PAS total scores. In addition to *z* scores, the researcher utilized boxplots, histograms, Q-Q plots (see Figures 1-3), and visual representations to assess distribution and outliers in the data. To identify outliers, the researcher reviewed boxplots to assess if any values fell far from the box (e.g., median). Outliers that fall far from the median are represented by circles and extreme outliers by an asterisk (Tabachnick & Fidell, 2013). Next, the researcher considered the normal distribution based on the histogram, a visual representation of the data's distributional shape (Hahs-Vaughn, 2017), wherein the researcher identified the presence of a bell-shaped curve. A bell-shaped curve is indicative of a normal distribution pattern (Hahs-Vaughn, 2017). Finally, the researcher viewed the Q-Q plot, showing normal probability of the data wherein values fell within a normal range along the line of normality and the remaining are outliers (Hahs-Vaughn, 2017). Based on the graphs below, the researcher concluded that outliers could be seen visually, and these outliers may have impacted the normality of the bell curve and linearity of the data.

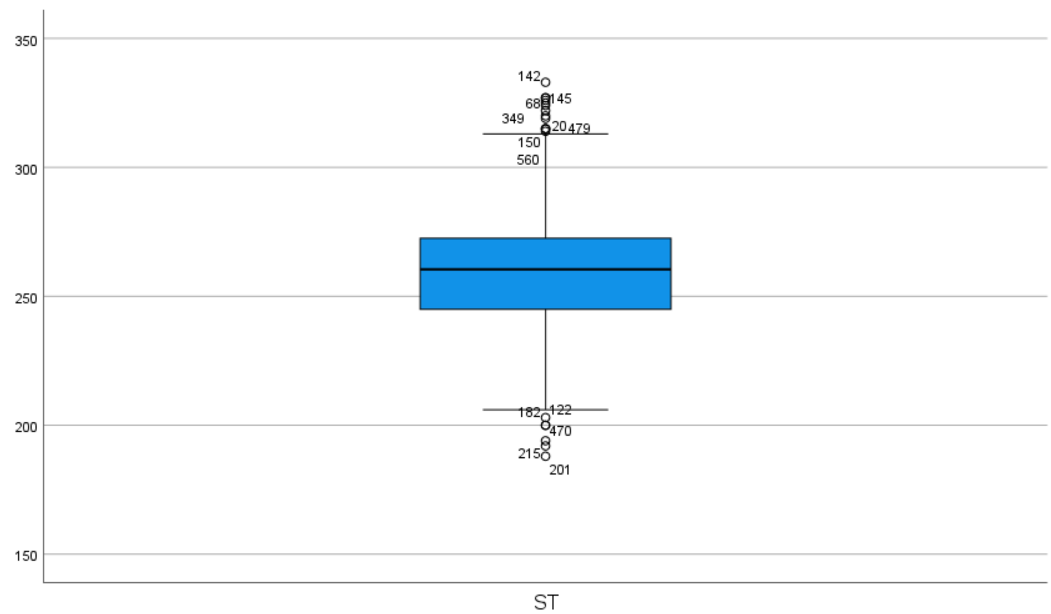

Figure 1. *HSPS Total Score Boxplot*

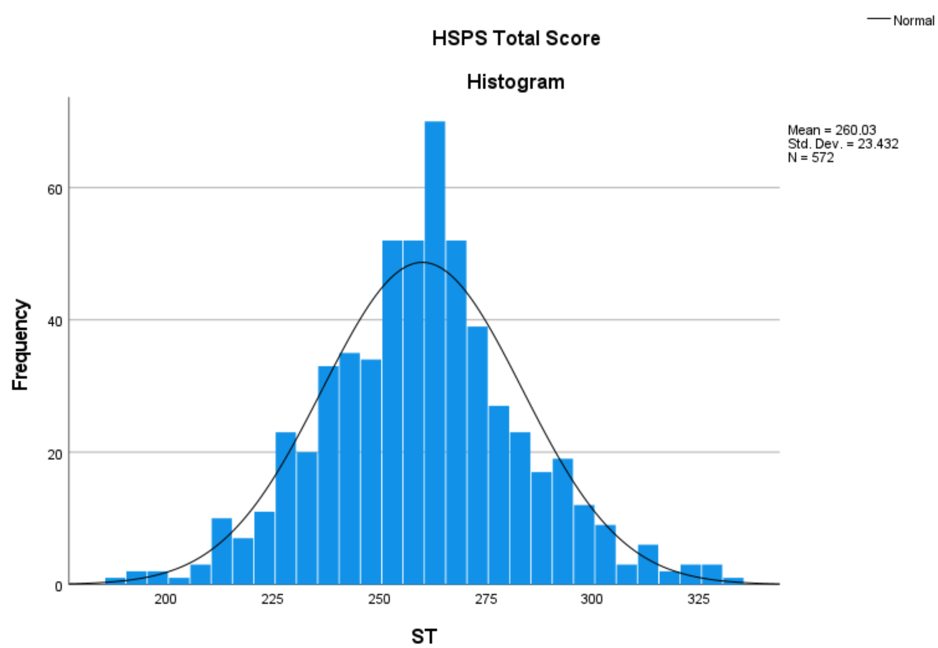

Figure 2. *HSPS Total Score Histogram*

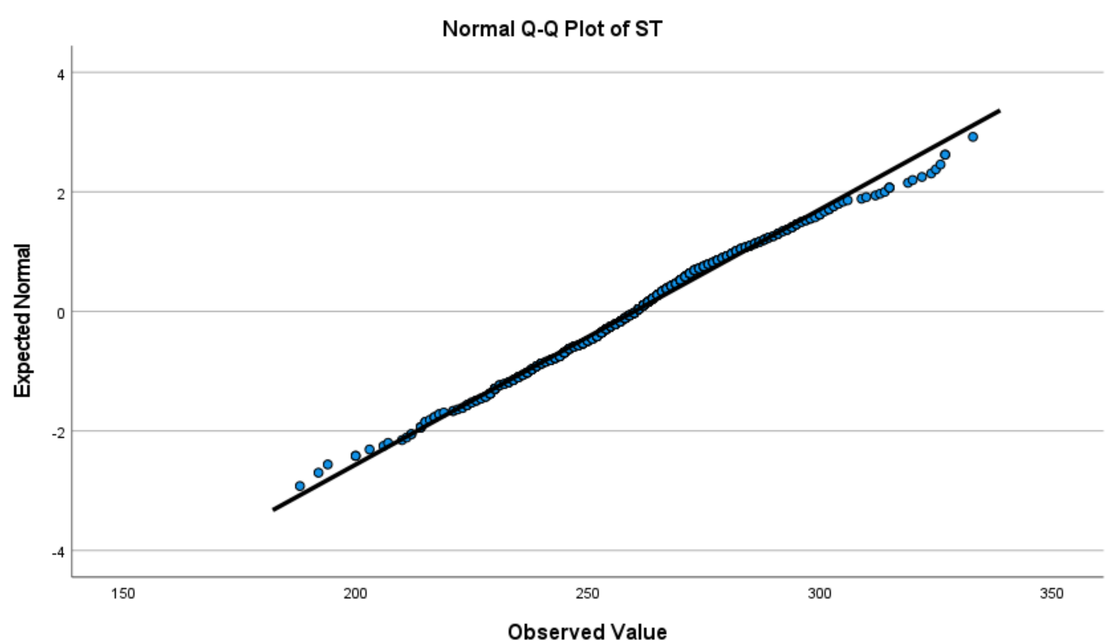

Figure 3. *HSPS Total Score Q-Q Plot*

Finally, the researcher looked at skewness ± 2.0 and kurtosis ± 7.0 (see Table 6, Hahs-Vaughn, 2017; Pallant, 2020). All skewness and kurtosis values were within normal range for the

HSPS. Based on the *z* scores and Q-Q plots, the researcher acknowledged the presence of outliers and then continued exploring assumptions by looking at how outliers impacted the normality of the distribution, using both Kolmogorov-Smirnov and Shapiro-Wilk tests.

In addition to visual inspection of normality and descriptive analysis of the data, the researcher assessed normality using both the Kolmogorov-Smirnov and Shapiro-Wilk test of normality. Both tests consider if the distribution of data is statistically different from a normal distribution. While the Kolmogorov-Smirnov test was statistically significant, the Shapiro-Wilk was insignificant and therefore the researcher concluded that data from the HSPS was normally distributed (Osborne, 2013; Pallant, 2020). Table 6 displays the statistical significance for each scale, confirming the assumptions of normality.

Table 6.

Tests of Univariate Normality

Scale	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	*df*	Sig.	Statistic	*df*	Sig.
HSPS	.055	572	.000	.993	572	.013

Based on the violation of univariate normality for the HSPS on the Kolmogorov-Smirnov test, the researcher continued with one additional test, the Mahalanobis distance (33.141) at a probability of $p < .001$, to assess multivariate normality. The researcher identified four cases that contained multivariate outliers. To test the impact these outliers had on the normal distribution of data, the researcher removed the four cases and found that neither statistical tests (Shapiro-Wilk and Kolmogorov-Smirnov) nor visual inspections of the data (histogram and Q-Q plots) showed any improvement regarding the normality of the data. Researchers have found that for larger samples (e.g., > 200) multivariate outliers are common; and at times, removal of outliers did not improve the accuracy of data analysis (Osborne, 2013; Tabachnick & Fidell, 2013). Based on both the scholarly insights and the fact that the removal of the four multivariate outliers did not improve univariate normality, the researcher decided to retain the four multivariate outliers.

In summary based on both usable responses and then the deletion of cases to address normality, the final sample size for the EFA was (N = 572). The sample size of N = 572 continued to meet the assumption of adequate sample size for not only the EFA, but also for the remaining statistical analyses of the subsequent research questions.

Analyses of Research Questions

Below the researcher outlined each research question considering (a) assumptions, (b) preliminary analyses, when needed, and (c) primary statistical analysis.

Research Question 1

For research question one, the researcher created a factor structure using an EFA. Prior to initiating statistical analyses, the researcher screened the data for missing values and outliers and checked if data from the sample met statistical assumptions when conducting and EFA (Hair et al., 2019; Osborne, 2013). Specifically, the researcher conducted the following data analyses including: (a) verifying adequate sample size, (c) linearity (c) outliers, (d) normality, (f) multicollinearity, and (g) factorability (Tabachnick & Fidell, 2013).

Assumptions. After data cleaning of the HSPS and deleting 5 univariate outliers, the final sample for the EFA was 572 and sufficient to meet the minimal participant-to-item ratio of 5:1 required for conducting an EFA with an initial 80 items (Dimitrov, 2012; Hair et al., 2019). Through visual inspection of scatterplots, the researcher assessed the linearity between items of the HSPS. Linearity is an assumption that if not met can bias the Pearson product-moment correlation coefficients (r), incorrectly influencing EFA outcomes (Reise et al., 2000). Based on the assessment of graphical data, the researcher identified no patterns of nonlinear relationships (Hahs-Vaughn, 2017); therefore, the researcher concluded that the assumption of linearity was satisfied with the HSPS dataset. While the researcher assessed outliers and normality during the data cleaning process, she only considered the HSPS total score. To assess for outliers and normality of items, the researcher considered boxplots, histograms, Q-Q plots, as well as skewness and kurtosis. In general, all boxplots, histograms, and Q-Q plots suggested normality of data. All item histograms produced a bell-shaped curve, indicating that the data was normally distributed. Additionally, both the Q-Q and boxplots indicated an absence of outliers. See figures 4-6 for examples of HSPS item 1.

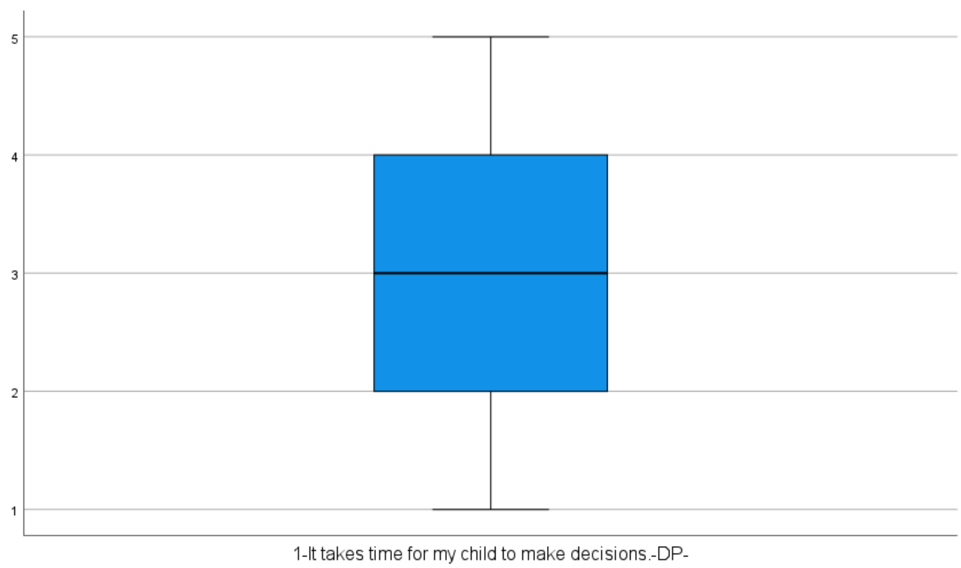

Figure 4. *HSPS Item 1 Score Q-Q Plot*

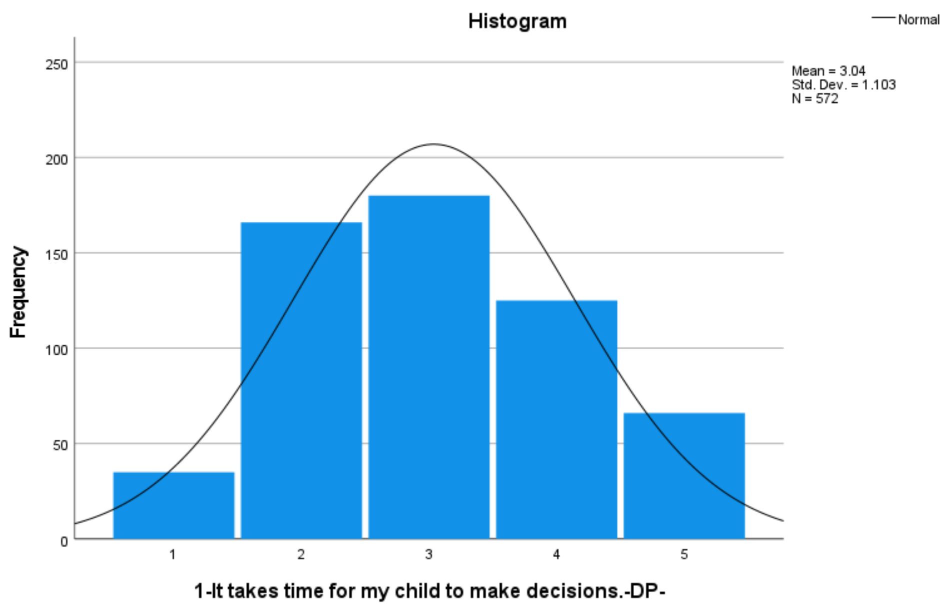

Figure 5. *HSPS Item 1 Score Histogram*

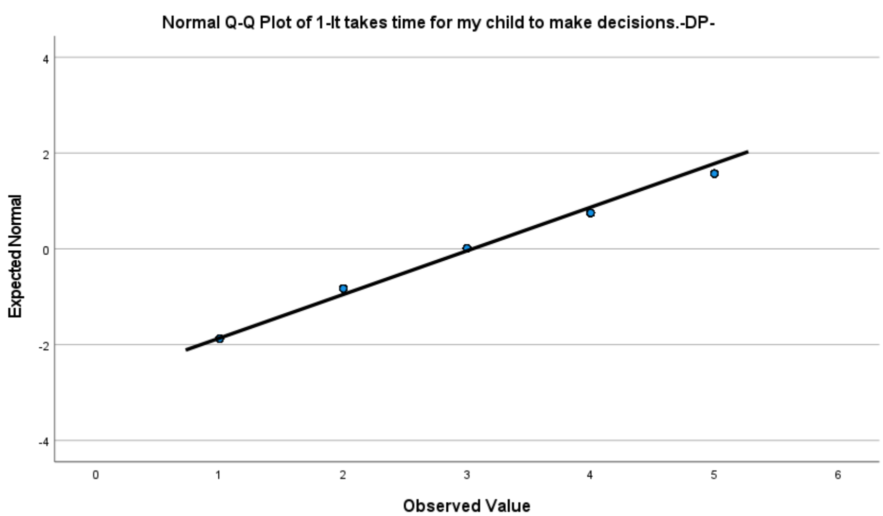

Figure 6. *HSPS Item 1 Score Q-Q Plot*

Finally, all 80 items fell within the normal range of skewness (± 2.0) and kurtosis (± 7.0; Hahs-Vaughn, 2017; Pallant, 2020). These results further support the presence of normality, suggesting no violation in the assumption of normality with these data, at both the univariate and multivariate level.

To assess for multicollinearity, the researcher ran a multiple regression for each item on the HSPS with the remaining items used as the independent variable. Then the researcher evaluated each item, using the variance inflation factor (VIF) and the Tolerance value. A VIF value < 10 and Tolerance value > 0.10 indicates no multicollinearity (Hahs-Vaughn, 2017). After running all 80 logistical regressions, the researcher found no evidence of violation in the assumption of multicollinearity.

The researcher conducted a maximum likelihood (ML) method with an oblique (Promax) rotation. Because the researcher met the assumption of normality, she used ML as the extraction method (Finch, 2020; Watson, 2017). Furthermore, the researcher selected the oblique rotation, Promax, because in social sciences researchers assume correlation amongst items (Costello & Osbrone, 2005). Next, the researcher used the following indices to conduct the initial factorability assessment (a) correlation coefficient values, (b) Kaiser-Meyer-Olkin (KMO; Kaiser, 1974) sampling adequacy, and (c) Bartlett's test of sphericity (Hahs-Vaughn, 2017; Watson, 2017). First, the researcher assessed each item's correlation coefficient; and if the researcher identified a coefficient to be less than .30 and not theoretically critical, she removed the item (Hahs-Vaughn, 2017). The researcher determined statistical significance using Bartlett's test of sphericity and KMO values. Specifically, the researcher needed the KMO value to be ≥ .60 to consider the shared variance amongst items mediocre and ≤ .90 to consider the shared variance as very good (Kaiser & Rice, 1974). Initial KMO value for the 80 item HSPS was .831 and Bartlett's Test of Sphericity was statistically significant (χ 2 = 17696.184, *df* = 3160, *p* < .0001). Kaiser and Rice (1974) considered KMO >.80 good and greater than the cutoff of .60, which is acceptable for factorability of the HSPS intercorrelation matrix (Dimitrov, 2012; Tabachnick & Fidell, 2013). To ensure the reliability of the KMO, the researcher must also attain communalities above .40 and have between 20-50 items (Hair et al., 2019). Because of the presence of more than 50 items, the researcher is aware that the number of factors recommended to be extracted may exceed an accurate number of factors for the model (Hair et al., 2019). Additionally, a statistically significant finding for the Bartlett's Test of Sphericity indicated overlapping variance amongst items in the measure, enabling the researcher to reduce the number of items that correlated with corresponding factors (Hahs-Vaughn, 2017). Finally, the researcher analyzed the psychometric properties from the initial sample, using exploratory factor analysis (EFA).

Preliminary Data Analysis. Prior to beginning data analysis for the EFA, the researcher determined if statistical differences between the two recruitment methods (online vs. data research panel) existed. The researcher conducted an independent t-test to determine if a statistically significant difference existed between the two recruitment groups across the HSPS total score. The researcher found a statistically significant difference where participants in the online recruitment group reported statistically significantly higher sensitivity scores (272.88 ± 27.11) than the data research panel group (255.40 ± 21.97), $t(575) = 8.091$, $p = .020$. Additionally, with the awareness of differences between groups the researcher ran an EFA with each group separately (online, n =168; research panel, n = 409), resulting in inconclusive findings using a maximum likelihood (ML) method with an oblique (Promax) rotation. Specifically, each EFA resulted in factors having an insignificant number (< 3; Hair et al., 2019) of items using a suppressed correlation of .40 in the pattern matrix (Hair et al., 2019), cutoff of communalities at .30 (less than the suggested <.40; Hair et al., 2019), and deletion of cross-loaded items (more than one factor > .40; Hair et al., 2019). The researcher considered results of the EFAs with caution; the results may have been impacted by the inadequate sample size in each group. Therefore, the researcher opted to combine the groups to conduct an EFA to determine the factor structure of the HSPS.

Next, the researcher considered theoretical tenants of SPS, regarding cutoff scores in identifying SPS in children (DeVellis, 2013; Dimitrov, 2012; Tabachnick & Fidel, 2013). Specifically, the researcher referenced previous studies in which researchers found 15-30% of the population had SPS in both adult and child populations (Arron & Jagiellowicz, 2012; Lionetti et al., 2018; Pluess et al., 2018). Based on previous findings, the researcher assumed 20% of kids might have sensory processing sensitivity and that the whole 80-item inventory was at least a rough measure of SPS. With that in mind, the researcher divided the sample into two groups, those in the top 20% in the first group and the remaining 80% in the second. The researcher identified the groups using Frequencies analysis in SPSS (version 27.0) and specified five cutoff groups (each representing 20% of the total score distribution). From these results, the researcher identified the cutoff point at 80%, which the researcher determined as 278 for the HSPS total score. The researcher then ran an independent sample t-test, using the Total Score as the comparison value and setting the *cut point* at 278, to identify items that were not statistically different across the two groups. The researcher used $p > .001$ as the cutoff (to account for the large sample) and identified thirteen items that did not show statistically significant differences across the groups: 4, 10, 11, 12, 16, 18, 42, 45, 51, 64, 74, 78 (see Table 7 for more details). To verify that the presence of these 13 items did not impact the quality of the model, the researcher ran each subsequent model, removing one item at a time. Before running the next model, the researcher would add in the item and remove the next item, finding no negative impact on either the statistical or practical significance of the model. Based on the findings, the researcher then omitted these items from any subsequent EFAs.

Table 7.

Items Omitted Based on the 20% Sample Cutoff

Item Number	Item Description	*M*	*SD*	*t* (577)	Sig (*p*)
4	My child isn't emotionally affected when	4.12	.940	2.309	.021
10	My child likes to help other kids.	4.41	.703	2.503	.013
11	It is common for my child to want to help	4.23	.807	2.578	.010
12	My child doesn’t understand humor.	4.31	.734	1.774	.077
16	My child easily stays on task in a calm	3.68	.965	-1.342	.180
18	My child is easily bored.	3.03	1.142	2.124	.034
42	My child notices when things are pretty.	4.40	.693	2.752	.006
45	My child has a high pain threshold.	3.44	1.030	2.105	.036
51	My child needs to be reminded to be kind to	3.29	1.084	-0.680	.497
64	My child enjoys performing in front of others.	2.62	1.235	2.240	.025
74	My child notices when something smells bad.	4.34	.730	2.679	.008
78	My child enjoys creating things using art	4.50	.700	2.908	.004

Note: All items were not statistically significant at $p < .001$.

Exploratory Factor Analysis (EFA). Prior to starting the EFA and with the help of a panel of experts, the researcher established 80 items, which she used in the analysis. The researcher created these 80 items from scholarship on SPS, previous SPS measurements, and both clinical and developmental expertise when working with preschool age children. Specifically, the researcher referenced five general categories related to SPS for the 80 items in the HSPS: (a) depth of processing, (b) overstimulated, (c) heightened emotions, (d) emotional awareness, and (e) sensitive to subtle stimuli. *Depth of Processing* encompassed the depth of questions asked by a child, presence of a clever sense of humor, and difficulty in making decisions (Aron, 2015; Jagiellowicz, 2012). *Overstimulated* encompassed a child taking in and noticing *all* subtle or minute aspects of their surroundings, leading to overstimulation and exhaustion. Additionally, they experience overstimulation in response to both internal and external demands (Smolewska, McCabe, & Woody, 2006; Sobocko & Zelenski, 2015). Furthermore, a child, who is easily overstimulated, has extreme responses to pain or change, frequently experiences meltdowns, and has difficulty falling and staying asleep (Aron, 2015). Finally, a child, who is easily overstimulated, experiences unpleasant arousal to external stimuli such as loud noises (Smolewska, McCabe, & Woody, 2006; Sobocko & Zelenski, 2015). *Heightened Emotions* include children who feel deeply, which leads to frequent crying and expressing emotion (Aron, 2015). Additionally, these children are perfectionistic and respond adversely to doing anything incorrectly (Aron, 2015). *Emotional Awareness* encompasses children who notice when others are in distress (Aron, 2015). Children not only recognize emotions within themselves but also in others, being displayed as an enhanced ability to show empathy. Individuals with SPS have a heightened awareness of when loved ones are happy or sad, as well as strangers (Acevedo et al., 2014). *Sensitive to Subtle Stimuli* is present in children, who notice slight changes in appearance of people, places, and things, being aware of communication styles including a glare, sigh, or tone of voice, and notice slight changes in smells (Aron, 2020; Smolewska, McCabe, & Woody, 2006; Sobocko & Zelenski, 2015). Children with this sensitivity are more in tuned to what adults (i.e., caregivers, coaches, teachers) want or expect from them, increasing their success in various activities (Aron, 2015). Finally, these children have an openness for, appreciation for, and/or the ability to be moved/inspired by the arts and other positive stimuli (Smolewska, McCabe, & Woody, 2006; Sobocko & Zelenski, 2015). For a summary of all scholarship supporting the initial 80 items, see Table 8.

Table 8.

Scholarship Support for Initial 80 items in the HSPS

General Category	Items	Citations
Depth of Processing	1, 2, 3*, 4*, 12*, 14, 15, 18, 19, 25, 36^*, 38^	Aron, 2015; Jagiellowicz, 2012
Overstimulated	16^, 17*^, 20*, 26, 27, 29, 30, 31*, 32, 33, 34, 36^*, 37, 38^, 39*, 40, 41, 44*, 45*, 54*, 55, 60*, 65^, 72, 73*	Aron, 2015; Smolewska, McCabe, & Woody, 2006; Sobocko & Zelenski, 2015
Heightened Emotions	9, 13*, 23, 35*, 46*, 48, 49, 52, 56*, 61, 64*, 65^, 70, 71^	Aron, 2015
Emotional Awareness	5, 6, 7, 8, 10, 11, 24*, 47, 50, 53, 57*, 62*, 63, 68, 71^	Aron, 2015; Acevedo et al., 2014
Sensitive to Subtle Stimuli	16^, 17*^, 21, 22, 28*, 42, 43, 51*, 59, 65^, 66*, 67, 69, 74, 75, 76, 77, 78, 79, 80*	Aron, 2015; Aron, 2020; Smolewska, McCabe, & Woody, 2006; Sobocko & Zelenski, 2015

Note. *Denotes a reverse scored item. ^Denotes an item in more than one category.

Next, the researcher assessed the number of factors to extract for the EFA using (a) Kaiser-greater-than-one, (b) Parallel Analysis (PA), (c) scree plot, and (d) prior research. Initially the researcher used the communalities cutoff score ($\geq .50$) to determine the number of factors to extract using Kaiser-greater-than-one, scree plot, and PA. The researcher first used Kaiser-greater-than-one to determine the number of factors to extract by finding all factors with an eigenvalue > 1 (Finch, 2020; Hahs-Vaughn, 2017). Within the analysis, the researcher found 10 factors > 1. Next, the researcher used Parallel Analysis (PA) to calculate the number of extracted factors, based on a comparison of eigenvalues of the data set and another synthetic dataset that shares both means and variance of the original data (Finch, 2020; Horn, 1965). When the eigenvalues of the synthetic dataset superseded the eigenvalues of the actual data, the researcher identified the cutoff number of factors to retain. The analysis indicated the need to retain 23 factors. Finally, the researcher looked at the scree plot and saw that the line began to plateau around 4 or 5 factors (see Figure 7), which provides a visual to determine number of factors to retain (Cattell, 1966; DeVellis, 2012). Considering the inconclusive results based on the three analyses, the researcher also considered scholarship on the established models of SPS, and parsimony (e.g., a model providing the simplest factor structure with the largest possible *variance explained* of the phenomenon being studied; Watkins, 2018). Previous models of SPS have resulted in three (Sobocko and Zelenski, 2015; Smolewska et al., 2006), four (Meyer et al., 2005), and five (May et al., 2020) factor models. Researchers have found that a solution with more factors than necessary has less error and is able to include a greater amount of variance accounted for than a solution not extracting enough factors; and based on the overlap between factor extraction methods and established scholarship on model of sensitivity, the researcher chose to begin with a five-factor model.

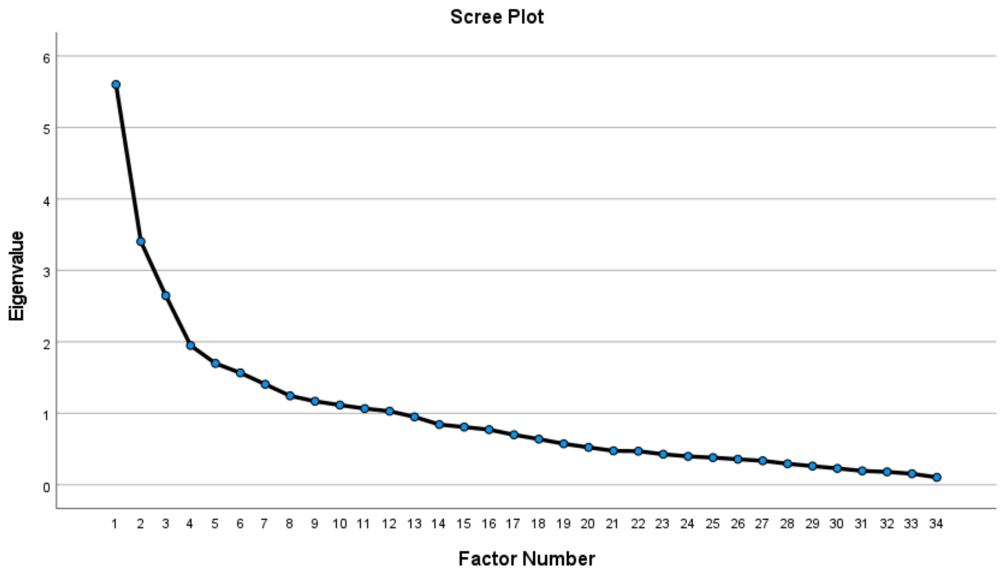

Figure 7. *Scree Plot*

Five-Factor Model. Based on the results of the scree test, the researcher implemented an EFA using a maximum likelihood (ML) method with an oblique (Promax) rotation, restricting the model to extract five factors. Furthermore, the researcher ran through six interations to complete the analysis of the five-factor model. An iteration is determined when the researcher determines a cutoff score related to the factor loading and then deletes, one at a time, items that fall below the cutoff. The initial model explained 29.82% across the five factors. The researcher then suppressed correlations below .30 (Pallant, 2020), deleting 14 items, one at a time, across three iterations. After the third iteration, the variance explained increased to 35.36%. Due to low communalities in this model, using a cutoff of 0.2 (Hahs-Vaughn, 2017; Tabachnick & Fidell, 2013), the researcher removed 29 items, one at a time and across three additional iterations. After the sixth iteration, the variance explained was 47.74%. After the removal of the previous 29 items, the researcher removed one more item due to falling below .30 in the pattern matrix.

The five-factor (24-item) solution had an internal consistency reliability of α = .826 and presented with 48.49% of the variance explained, approaching the acceptable range of 50% in social sciences (Roberts and Henson, 2006). The researcher was able to conclude that final solution sufficiently explained the phenomenon of caregiver to observed SPS related behaviors in their preschool age children. Specifically, Factor 1 (*Response to Others and Environment* [ROE], n = 8) accounted for 16.12% of the variance, Factor 2 (*Empathy*, n = 6) 9.65%, Factor 3 (*Noticing and Appreciating Others and Surroundings* [NAOS], n = 3) 8.67%, Factor 4 (*Sleep*, n = 4) 8.12%, and Factor 5 (*Emotional Response* [ER], n = 3) 5.93% of the variance (see pattern matrix below in Table 11).

Additionally, based on identified similarities across items (e.g., in Factor 5, Emotional Response, both items 59 and 75 overlap in content), the researcher evaluated repetition of items and omitted the item with the weakest correlation within the pattern matrix. The researcher removed the following items, accompanied by the item retained for the EFA: 1 (3), 8 (7), 20 (28), 21 (43), 37 (29), 35 (56), 40 (27), 49 (52), 50 (63), 75 (59). In rerunning the five-factor model with the repeated items, the model did not converge.

Finally, based on the preliminary analysis of the EFA, the researcher investigated if any of the subscales were biased by the recruitment type using a one-way MANCOVA.

Table 9.

Pattern Matrix for the Five-Factor Model

Item	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
3 - My child is able to quickly make a choice.	.770	--	--	--	--
19 - It takes a lot of time for my child to make a	.749	--	--	--	--
1 - It takes time for my child to make decisions.	.675	--	--	--	--
54 - My child enjoys trying new things.	.474	--	--	--	--
65 - My child has difficulty completing a task under	.403	--	--	--	--
60 - My child becomes excited for new opportunities (e.g., starting school).**	.397*	--	--	--	--
28 - My child does not have difficulty when changes	.394*	--	--	--	--
77 - My child startles easily.	.372*	--	--	--	--
63 - When a character on tv is sad, my child looks sad.	--	.678	--	--	--
6 - My child feels sad when seeing someone else who	--	.605	--	--	--
68 - My child notices when I am emotional.	--	.587	--	--	--
7 - If my child knows I am having a hard time, my child tries to comfort me.	--	.559	--	--	--
8 - My child notices when I am having a hard day.	--	.545	--	--	--
5 - My child notices when their friend is upset.	--	.495	--	--	--
79 - My child enjoys music.	--	--	.964	--	--
80 - My child doesn't notice when things are pretty.**	--	--	.887	--	--
24 - My child doesn't recognize feelings in others.**	--	--	-.842	--	--
37 - My child has trouble getting to sleep after a	--	--	--	.873	--
29 - It is hard for my child to fall asleep after a busy	--	--	--	.870	--
31 - My child sleeps well through the night.	--	--	--	.503	--
32 - My child wakes up often in the night.	--	--	--	.454	--
59 - My child becomes emotionally upset when	--	--	--	--	.926
75 - My child is emotional when they are hungry.	--	--	--	--	.892
71 - My child becomes upset when someone raises	--	--	--	--	.374*

Note. * Denotes a weak correlation value. ** Denotes a reverse scored item. -- Denotes correlations suppressed at .30. Factor 1 interpreted as *Response to Others and Environment*; Factor 2 interpreted as *Empathy*; Factor 3 interpreted as *Noticing and Appreciating Others and Surroundings*; Factor 4 interpreted as *Sleep*, Factor 5 refers to *Emotional Response*.

One-Way MANCOVA. The researcher referred to the preliminary analysis to assess if recruitment type (online vs. data research panel) impacted any of the established factors. The researcher conducted a one-way MANCOVA to test the impact on recruitment type on each subscale while controlling for the total score (covariate). In considering the values of the effect size (i.e., practical significance), the researcher considered whether the effect of the partial eta squared (η2) was small (0.01), medium (0.06), or large (.0.14; Hahs-Vaughn, 2017). The one-way MANCOVA detected a between-subjects effect between Factor 3 (*Noticing and Appreciating Others and Surroundings*) and recruitment type, F (1,558) = 4717.514, $p < .0001$, η2 = .891. The researcher concluded that 89.1% of the variance explained in Factor 3, *Noticing and Appreciating Others and Surroundings*, was due to the demographic differences that were evident in the recruitment methods. Based on the findings, the researcher deleted Factor 3, which included items 24, 79, and 80. See Table 10 for between-subject effects of all factors based on recruitment. Finally, other subscale levels were not practically significant at the η2 = .06 (moderate effect size; Hahs-Vaughn, 2017), despite being statistically significant at the p = .05.

Table 10.

One-Way MANCOVA Between -Subjects Effects of Recruitment

Variable	F (1,580)	η^2	Sig.
Factor 1	.008	.000	.931
Factor 2	4.486	.008	.035
Factor 3	4717.514	.891	.000
Factor 4	.603	.001	.003
Factor 5	9.078	.015	.003

Note. Significant at the p < .05 level. Factor 1 interpreted as *Response to Others and Environment*; Factor 2 interpreted as *Empathy*; Factor 3 interpreted as *Noticing and Appreciating Others and Surroundings*; Factor 4 interpreted as *Sleep*, Factor 5 interpreted as *Emotional Response*.

From the results of the MANCOVA and the five-factor model not converging with similar items deleted the researcher chose to rerun the model restricted to four factors.

Four-factor model. researcher then opted to rerun the model. Specifically, the researcher reran the EFA using a maximum likelihood (ML) method with an oblique (Promax) rotation, restricting the model four factors. Furthermore, the researcher suppressed correlations below .35 and individually removed items 66, 17, 2, 44, and 30. Next, the researcher deleted communalities that were < .3, which were greater than the minimum cutoff of .2 (Hahs-Vaughn, 2017; Tabachnick & Fidell, 2013). Communalities indicate the total variance explained by an item, and therefore are potentially explained by the factor (Kline, 2016). The remainder of the variance is not explained by any factor in the model such as a phenomenon or characteristic unexplained across factors (Kline, 2016). Additionally, Hahs-Vaughn (2017) advised not all low communalities merit removal if the item is "contributing to a well-defined factor" (p. 370). Based on the established literature on EFAs, the researcher maintained a cutoff of .3 for communalities and individually removed 16 items (13, 14, 23, 26, 27, 36, 39, 46, 48, 52, 53, 55, 56, 62, 72, and 76). Despite removing items with low communalities, communality values continued to decrease across remaining items; therefore, the researcher did not see it as beneficial to continue to remove items based on communalities (see Table 11 for more details). Since the removal of items did not improve overall variance in the model, the researcher then added each one back in, one at a time, to see if any item contributed to the increase of variance explained. The researcher did not see any improvement in variance explained, and therefore chose to leave omitted items out of the model. Due to cross loading onto multiple factors (> .4; Hair et al., 2019), the researcher also removed item 59. After the removal of item 59, the researcher removed additional seven items, one at a time, that had fallen below the cutoff of .4, a more rigorous cutoff suggested by Hair and colleagues (2019) to increase parsimony of the model, for suppressed correlations (items 34, 38, 41, 47, 67, 70, and 71).

Table 11.

Communalities of Items in Final HSPS Model

Item	Item Description	Extraction
5	My child notices when their friend is upset.	.313
72	Loud noises startle my child.	.526
73*	Loud places do not overwhelm my child.	.420
77	My child startles easily.	.426
21	My child remembers small details.	.448
22	My child notices when small things have change (e.g., person's appearance, item has been moved).	.580
52	When something doesn't come easily to my child, they can become upset.	.387
59	My child becomes emotionally upset when hungry.	.309
47	My child becomes upset when they don't feel understood.	.423
8	My child notices when I am having a hard day.	.499
7	If my child knows I am having a hard time, my child tries to comfort me.	.534
68	My child notices when I am emotional.	.534
43	My child notices detail others might miss.	.399
71	My child becomes upset when someone raises their voice.	.310
6	My child feels sad when seeing someone else who is sad.	.268

Note. * Denotes a reversed score item.

The researcher identified a final 15-item, four-factor assessment that explained 41.45% of the variance and an internal consistency reliability of $\alpha = .708$. The researcher assigned the following labels to each factor: Factor 1 (*Empathy*, $n = 5$) accounted for 17.92% of the variance, Factor 2 (*Response to Stimuli*, $n = 3$) 11.85%, Factor 3 (*Attention to Detail*, $n = 3$) 6.6%, and Factor 4 (*Emotional Response*, $n = 4$) 5.1%. Additionally, the researcher calculated the inter-factor correlations. Significant inter-factor correlations support the presence of related factors measuring a single phenomenon. Furthermore, the correlations underlying the model show support for the factorability of the items; an assumption also supported by the final KMO score of .760 (middling; Kaiser & Rice, 1974), greater than the cutoff of .60 (Pallant, 2020). In considering the values of inter-factor correlations, the researcher considered whether the intercorrelations were high (.70), moderate (.45), or low (.20; Clark & Bowles, 2018; Mvududu & Sink, 2013). Both Factors 1 and 3 ($r = .346$) as well as 2 and 4 ($r = .483$) were near moderately to moderately correlated. Additionally, Factors 1 and 4 ($r = .206$) were weakly correlated, while Factors 2 and 1 ($r = .101$), 2 and 3 ($r = .152$) had a very small correlation. The bifurcate pattern, in which caregivers either identified with positive behaviors (Factors 1 and 3) or challenging behaviors (Factors 2 and 4), was consistent throughout all conducted EFAs. Next, the researcher will continue with the analyses of the psychometric properties to better understand items within the measure to then inform future research.

Table 12.

Pattern Matrix for the Final Four-Factor Model

HSPS Item	Factor 1	Factor 2	Factor 3	Factor 4
7-If my child knows I am having a hard time, my child tries to comfort me.	.754	--	--	--
8-My child notices when I am having a hard day.	.733	--	--	--
5- My child notices when their friend is upset.	.544	--	--	--
68- My child notices when I am emotional.	.526	--	--	--
6- My child feels sad when seeing someone else who is sad.	.458	--	--	--
72- Loud noises startle my child.	--	.748	--	--
73- Loud places do not overwhelm my child.	--	.666	--	--
77- My child startles easily.	--	.605	--	--
22- My child notices when small things have change (e.g., person's appearance, item has been moved).	--	--	.770	--
21- My child remembers small details.	--	--	.652	--
43- My child notices detail others might miss.	--	--	.609	--
47- My child becomes upset when they don't feel understood.	--	--	--	.667
52- When something doesn't come easily to my child, they can become upset.	--	--	--	.642
59- My child becomes emotionally upset when hungry.	--	--	--	.521
71- My child becomes upset when someone raises their voice.	--	--	--	.312*

Note. * Denotes a weak correlation value. -- Denotes correlations suppressed at 0.30. Factor 1 interpreted as *Empathy*; Factor 2 interpreted as *Response to Stimuli*; Factor 3 interpreted as *Attention to Detail*, Factor 4 interpreted as *Emotional Response*.

Research Question 2

The researcher assessed internal consistency of the HSPS four-factor model using Cronbach's Alpha to answer research question 2. Values for Cronbach's Alpha range between 0 and 1 (DeVellis, 2012). Furthermore, the researcher used the analysis to determine how reliable the set of items were within the HSPS. Considering internal consistency reliability, the researcher attained an acceptable level of internal reliability (α = .744), close to the optimal score between .80 and .90 (Hahs-Vaughn, 2017). Additionally, most factors showed an acceptable level of internal reliability (Factor 1, α = .759; Factor 2, α = .723, Factor 3, α = .716), with Factor 4 (α = .658) showing a less than acceptable level of internal reliability with a cutoff of .70 (DeVellis, 2013). The lower value of Factor 4 indicated that items were heterogeneous, potentially indicating that the content of the items does not accurately represent the factor on which the items are loaded (Kline, 2016). Based on this potential concern, the researcher attempted to delete items from Factor 4, one at a time, and no other combination of items produced a higher Cronbach's Alpha value.

Research Question 3

To assess convergent and discriminant validity of the HSPS, the researcher considered the relationship between the total scales and all subscales across the three instruments: HSPS, ATEC and PAS. See Table 14 and 15 for the outcomes of the Spearman rho correlations. Prior to initiating the analysis, the researcher hypothesized the HSPS total score would have a moderate to strong correlation with (a) ATEC subscale, Sensory/Cognitive Awareness and (b) PAS subscales: Generalized Anxiety and Social Anxiety. To answer Research Question 3, the researcher (a) considered fit of the data for each instrument (e.g., PAS, ATEC) using a maximum-likelihood confirmatory factor analysis (CFA) (b) considered assumptions to conduct a Spearman rho correlation, and (c) analyze the relationship between scales using Spearman rho correlations.

Confirmatory Factor Analysis. Using SAS (version 9.4), the researcher used three goodness-of fit indices (RMSEA, CFI, and SRMR) to evaluate model fit of the item parameters in the way in which participants answered items. The root mean square error of approximation (RMSEA) indicates how well a model fits the general population not just the representative sample in a study. Additionally, a RMSEA value closer to 0 implies better fit to the general population, and a value of 0 implies best fit (Hair et al., 2019). In general, RMSEA below 0.05 is considered as good fit, and RMSEA over 0.1 suggests poor fit (Browne & Cudeck, 1993). However, RMSEA values up to .08 are acceptable. Similarly, SRMR, also known as the Standardized Root Mean Square Residual, also looks at the error in the model when considering the general population, so that a value closer to 0 implies a better fit (Kline, 2016). In general, a value SRMR < .10 indicates a good fit (Kline, 2016). Whereas the CFI, also known as the Bentler Comparative Fit Index, calculates the variance between the actual model and the null model (Kline, 2016). In general, a CFI > .90 suggests a good fit.

Schumacker and Lomax (2016) shared that when using a model from unrelated research, “a model may not fit the data” (p.108). Therefore, the researcher considered how to modify each of the models (i.e., PAS and ATEC) to specify a model that optimally fits the current data. Specifically, the researcher considered both the overall fit of the model (i.e., fit indices) and the individual fit parameters (i.e., parameter estimates and standardized results; Kline, 2016). Considering the parameter estimates, the researcher considered values of 0.5-1.00 as a strong relationship, values of 0.30 to .49 as a moderate relationship, and values less than .29 as a weak relationship (Pallant, 2020).

PAS. For the PAS, the researcher used a sample of caregivers of preschool children (N = 558). She conducted a maximum-likelihood CFA, chi-square of 1578.07 (df = 340, p < .0001), and goodness-of-fit indices indicated an adequate to poor fit of the data (RMSEA = 0.08; CFI = 0.82; SRMR = 0.07; Kline, 2016). Additionally, the Chi-Square is sensitive to larger sample sizes (>200); therefore, with a sample of over 500, the researcher expected to find of a significant Chi-Square (Kline, 2016). Furthermore, as the researcher previously mentioned both the RMSEA (0.08) and SRMR (0.07) indicated an adequate fit to the model, while the CFI = 0.82 indicated a poor fit. Therefore, the researcher considered both the overall fit of the model (i.e., fit indices) and the individual fit parameters (i.e., parameter estimates and standardized results; Kline, 2016). Using both parameter estimates and standardized results, the researcher individually removed nine items, leaving 19 items on the PAS. Specifically, the researcher removed no items from the *Generalized Anxiety* subscale (n = 5), 2 items in the *Social Anxiety* subscale (n = 4), 1 item from the *Obsessive Compulsive Disorder* subscale (n = 4), 4 items from the *Physical Injury Fear* subscale (n = 3), and 2 items from the *Separation Anxiety* subscale (n = 3). The researcher conducted a modified maximum-likelihood CFA, resulting in a Chi-square of 1255.54 (df = 371, p < .0001), and goodness-of-fit indices indicated an adequate fit of the data (RMSEA = 0.08; CFI = 0.90; SRMR = 0.06; Kline, 2016).

ATEC. The researcher used a sample of caregivers of preschool children (N = 558) and conducted a maximum-likelihood CFA, resulting in a Chi-square of 8658.99 (df = 2843, p < .0001), and goodness-of-fit indices indicated an adequate to poor fit of the data (RMSEA = 0.06; CFI = 0.68; SRMR = 0.07; Kline, 2016). As the researcher previously stated, the statistical significance found in the Chi-Square was expected due to sample size (>200; Kline, 2016). Furthermore, based on the poor fit for the CFI fit index (0.68), the researcher considered both the overall fit of the model (i.e., fit indices) and the individual fit parameters (i.e., parameter estimates and standardized results; Kline, 2016). Using both parameter estimates and standardized results the researcher individually removed 50 items one at a time, leaving 27 items in the ATEC scale. Specifically, the researcher removed eight items in the *Speech/Language/Communication* subscale (n = 6), 16 items in the *Sociability* subscale (n = 4), 10 items in the *Sensory/Cognitive Awareness* subscale (n = 8), and 16 items in the *Health/Physical/Behavior* subscale (n = 9). The researcher conducted a modified maximum-likelihood CFA, resulting in a Chi-square of 1010.82 (df = 318, p < .0001), and goodness-of-fit indices indicated an adequate fit of the data (RMSEA = 0.06; CFI = 0.90; SRMR = 0.06; Kline, 2016). After modifying the model, the researcher reran the assumptions of normality, linearity, and homoscedasticity and found no changes; therefore, the researcher was confident to move forward with Spearman rho correlations, a non-parametric measure to address non-normality of the both the PAS and ATEC and analyze the relationship between all total and subscale scores.

Assumptions. The first assumption is that both items in scales be either interval or ratio level of measurement. Pallant (2020) stated that many researchers in the social sciences consider Likert Scales values to be ordinal level data and are therefore not considered interval level scaling. While Pearson product moment correlations allow for interval and ratio level data, Spearman rho only requires that items in scales be at least ordinal level data (Kline, 2016, Pallant, 2020). While the researcher could not meet the assumption for the bivariate correlation analysis, she utilized an alternative non-parametric version of the Pearson product-moment correlation, Spearman rho, to assess for statistical and practical significance.

The next assumption is that the data does not have outliers and is normally distributed. While the researcher assessed for both outliers and normality during the data cleaning process, she re-ran the analyses since she had replaced missing data using multiple imputation with chained equations (MICE; van Buuren, 2007). To assess for outliers and assumption of normality on the PAS and ATEC, the researcher assessed for skewness and kurtosis, which is a visual inspection of boxplots to identify the presence of outliers (see Figures 8-10). Specifically for the Modified PAS total and its corresponding subscales, the skewness values ranged from .599 and 1.15, while the kurtosis values ranged from -.024 to -.753. For the Modified ATEC total and its corresponding subscales, the skewness values ranged from -2.582 to 2.617, while the kurtosis values ranged from 3.098 to 7.803. For the HSPS total and its corresponding subscales, the skewness values ranged from -.795 to .628 while the kurtosis values ranged from -.184 to .611. Based on the cutoff for skewness ± 2.0 and kurtosis ± 7.0 (Hahs-Vaughn, 2017; Pallant, 2020), the researcher determined skewness and kurtosis values were within normal range across both the HSPS and PAS, while the ATEC showed evidence of non-normality.

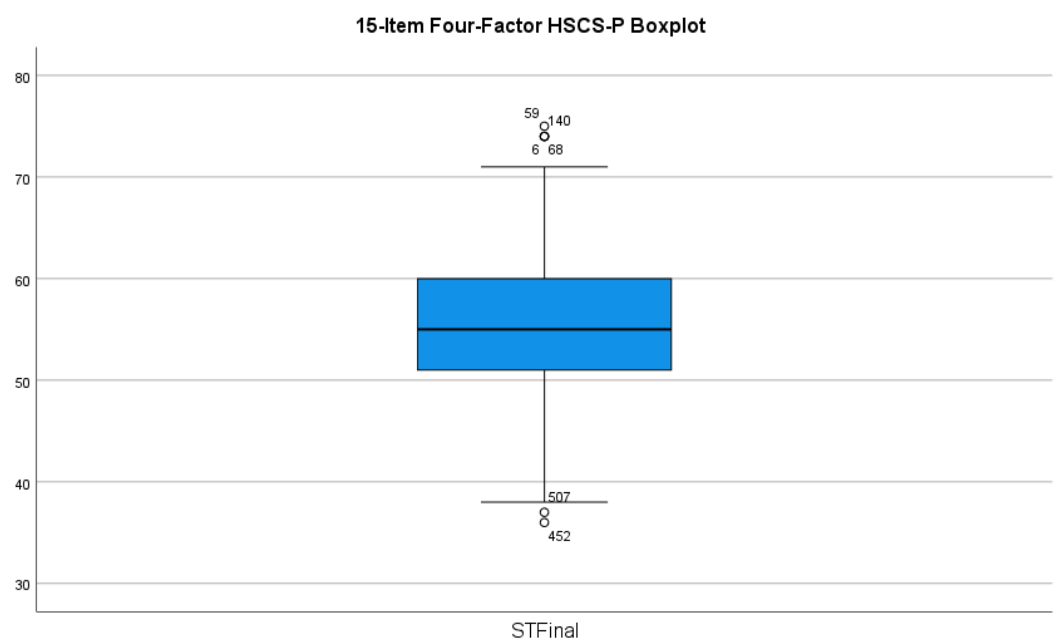

Figure 8. *Final HSPS Boxplot*

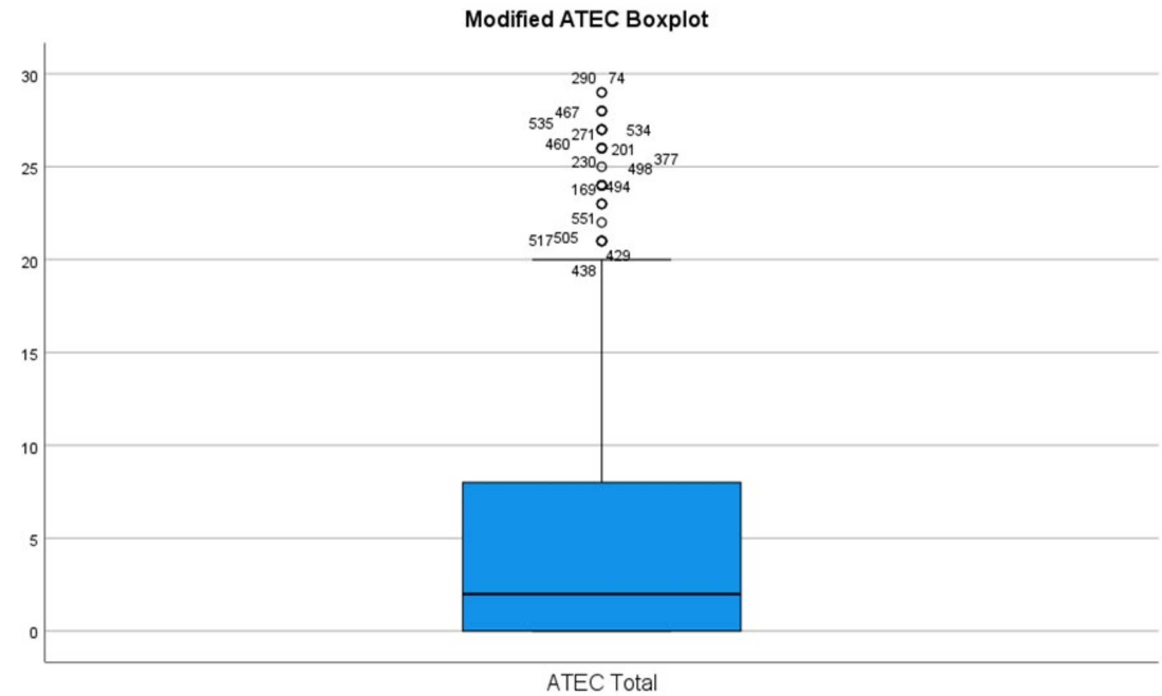

Figure 9. Modified ATEC Boxplot

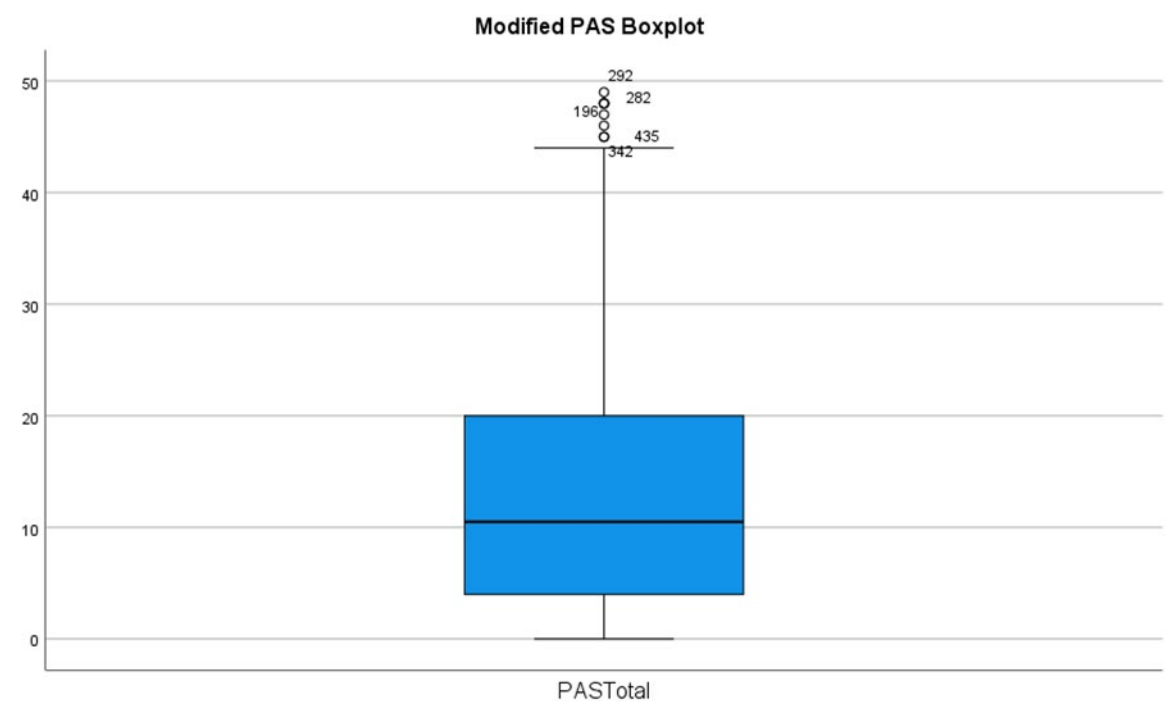

Figure 10. Modified PAS Boxplot

For the final four-factor, 15-item model, the researcher used visual inspection of boxplots and identified the presence of a *singzle* outlier across the three scales. Additionally, the researcher converted standardized z scores of the three scales (i.e., Four-Factor HSPS, Modified PAS, and Modified ATEC) and identified any values ± 3.0 (Osborne, 2013). Using the standardized z cut off score of ± 3.0 (Osborne, 2013), the researcher deemed one case (0.12%) of total scale for four-factor HSPS, 2 cases (0.3%) of the total scales for the modified PAS, and 15 cases (3.1%) of the total scales for the modified ATEC as outliers. After the researcher omitted the 19 cases, from the original sample of $N = 577$, she then explored assumptions of normality by looking at how outliers impacted the distribution of data, using both the Kolmogorov-Smirnov and Shapiro-Wilk tests (see Table 13). As the researcher already determined above in Section *Univariate and Multivariate Normality*, both the ATEC and PAS achieved statistical significance, suggesting non-normality within the data. The final HSPS showed non-significance, and therefore met the assumption of normality. Based on the analysis, the researcher then used a total sample of $N = 558$ to move forward with the bivariate analysis considering the relationship between the final HSPS.

Table 13.

Tests of Univariate Normality

Scale	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	*df*		Statistic	*df*	
HSPS	.051	558	HSPS	.051	558	HSPS
PAS	.140	558	PAS	.140	558	PAS
ATEC	.230	558	ATEC	.230	558	ATEC

In the data cleaning section above, the researcher identified several outliers within the PAS and ATEC, as well as non-normal histograms. The researcher used scatterplots to assess both linearity and homoscedasticity, wherein all three scales met these assumptions (see Figure 11 for example of homoscedasticity). Due to non-normal distribution of two of the scales and researchers' view that Likert scale type data is ordinal level data (e.g., Pallant, 2020), the researcher chose to use the non-parametric measure, Spearman rho, to assess correlations between scales and subscales (Kline, 2016).

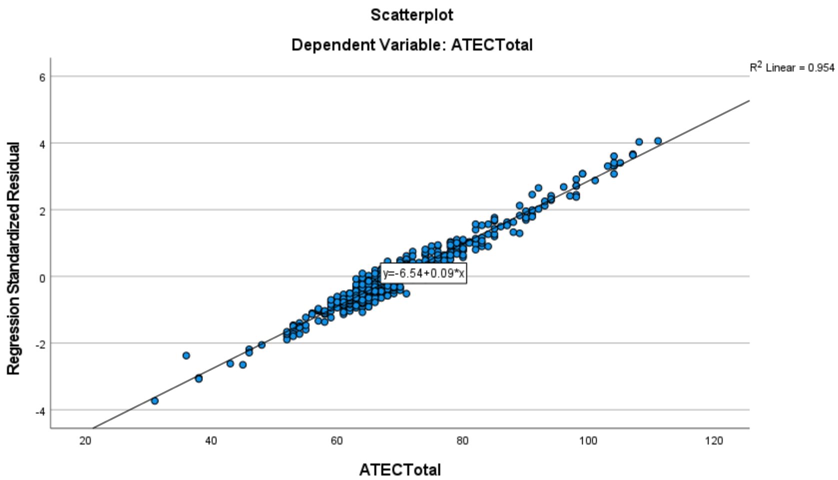

Figure 11. *ATEC Scatterplot for Homoscedasticity*

Spearman rho Correlations. Pallant (2020) warned researchers that while they can often find statistical significance within large samples, many times correlations between scales represent very small effect sizes. Effect sizes, often termed practical significance, represent true effect within the studied population (Ferguson, 2016). Furthermore, Ferguson (2016) suggested that within social science data researchers should consider correlations of 0.2 as the recommended minimum effect size, 0.5 as moderate effect size, and 0.8 as a strong effect size. Ferguson (2016) further suggested that researchers consider previous effect sizes from related research to better understand average effect sizes of the phenomenon studied. Unfortunately, due to the uniqueness of the current study, previous analyses are not available. As such the researcher took results from the first correlation matrix (Table 16) and only noted correlations with both statistical ($p < 0.01$) and practical significance ($rho \geq 0.2$) in the second correlation matrix (Table 14).

Table 14.

Spearman rho Correlations Between HSPS and both PAS and ATEC

	HSPS Total Score	Empathy	Response to Stimuli	Attention to Detail	Emotional Responses
PAS Total	.237**	-.103*	.400**	--	.279**
Generalized Anxiety	.256**	--	.340**	--	.320**
Social Anxiety	.127**	-.115**	.269**	--	.173**
Obsessive Compulsive	--	-.177**	.252**	--	.121**
Physical Injury Fears	.230**	-.101*	.432**	--	.240**
Separation Anxiety	.153**	--	.252**	--	.167**
ATEC Total	--	-.253**	.232**	-.100*	.129**
Speech/Language and Communication	-.153**	-.205**	.102*	-.200**	--
Sociability	--	-.200**	.148**	--	.167**
Sensory/Cognitive Awareness	--	-.233**	.236**	-.164**	.093*
Health/Physical/Behavior	.110**	-.130**	.186**	--	.177**

Note. ** Correlation is significant at the 0.01 level (2-tailed); * Correlation is significant at the 0.05 level (2-tailed); -- Denotes statistical non-significance.

Table 15.

Spearman rho Correlations Between HSPS and both PAS and ATEC

	HSPS Total Score	Empathy	Response to Stimuli	Attention to Detail	Emotional Responses
PAS Total	.237**	- *	.400**	--	.279**
Generalized Anxiety	.256**	--	.340**	--	.320**
Social Anxiety	- **	- **	.269**	--	- **
Obsessive Compulsive.	--	- **	.252**	--	- **
Physical Injury Fears	.230**	- *	.432**	--	.240**
Separation Anxiety	- **	--	.252**	--	- **
ATEC Total	--	-.253**	.232**	- *	- **
Speech/Language and Communication	- **	-.205**	- *	-.200**	--
Sociability	--	-.200**	- **	--	- **
Sensory/Cognitive Awareness	--	-.233**	.236**	- **	- *
Health/Physical/Behavior	- **	- **	- **	--	- **

Note. ** Correlation is significant at the 0.01 level (2-tailed); * Correlation is significant at the 0.05 level (2-tailed); - Denotes minimal effect size; -- Denotes statistical non-significance.

When analyzing correlations, Ferguson (2016) suggested that, within social science data, the minimum effect size to be 0.2, 0.5 as moderate effect size, and 0.8 as a strong effect size. Based on the results shown in Table 15 and the researcher's hypotheses for discriminant and convergent validity, the researcher found minimal practical significance and strong statistical significance between the HSPS total scores and the PAS total score (*rho* = .237, $p < .01$). Considering HSPS subscales, the strongest correlation the researcher identified was between the HSPS subscale, *Response to Stimuli* and PAS subscale, *Physical Injury Fears* (*rho* = .432, $p < .01$). Furthermore, when looking at the association between HSPS with the *Generalized Anxiety Subscale*, the researcher found a smaller than expected correlation (*rho* = .256, $p < .01$); yet she found a stronger correlation between the *Response to Stimuli* subscale and *Generalized Anxiety* subscale (*rho* = .340, $p < .01$). Finally, while the researcher hypothesized a significant correlation to exist between HSPS and the PAS subscale *Social Anxiety*, the researcher found a significant correlation, yet very small effect size (*rho* = .127, $p < .01$).

The researcher found a statistically non-significant correlation between the HSPS total score and the ATEC total score (*rho* = -.008, $p > .05$). Considering HSPS subscales, the researcher identified a small, positive correlation between the HSPS subscale *Response to Stimuli* and ATEC subscale *Sensory/Cognitive Awareness* (*rho* = .236, $p < .01$). Additionally, the researcher found a small, negative correlation between the HSPS subscale *Empathy* and the ATEC subscale *Sensory/Cognitive Awareness* (*rho* = -.233, $p < .01$). The researcher will discuss implications of Spearman rho correlations in Chapter 5.

Research Question 4

To address research question four, the researcher considered the relationship between HSPS item and total scores with reported demographic data. Specifically, the researcher conducted a one-way multivariate analysis of covariance (MANCOVA), allowing for all types of data. Additionally, by using a one-way MANCOVA, the researcher was able to detect any relationship between each item used in the final HSPS model and reported demographic data *and* determine the intersectionality of participants. Moreover, the researcher was able to use the total score as the covariate to then compare participants with similar total scores. To answer research question four the researcher (a) considered assumptions to conduct a one-way MANCOVA, and (b) analyzed the relationship between each HSPS item and demographic data using a one-way MANOVA, after not meeting all assumptions for the MANCOVA.

Assumptions. Previously, the researcher discussed all general assumptions for statistical analyses including sample size, normality, linearity, and multicollinearity. More specifically related to the one-way MANCOVA, the data must present with more cases in each cell than the number of dependent variables (Pallant, 2020). Due to the large sample size (N = 577), the researcher was able to meet the needed sample size having the minimum 5 cases (e.g., participants) per scale (total of 5 scales including the HSPS and four subscales). Additionally, the dependent variables had to be continuous wherein all 5 dependent variables (i.e., HSPS and four subscales) in the analysis, as well as the covariate (HSPS total score), are continuous variables.

To determine the assumption of normality across the HSPS total score, and four subscales (i.e., *Empathy, Response to Stimuli*, *Attention to Detail*, and *Emotional Response*), the researcher used visual inspection of boxplots (see Figures 12-16) and identified the presence of a outliers across the scales. Finally, the researcher looked at skewness ± 2.0 and kurtosis ± 7.0 (see Table 6, Hahs-Vaughn, 2017; Pallant, 2020). All skewness and kurtosis values were within normal range across the HSPS and subscales (*Empathy*, *Response to Stimuli*, *Attention to Detail*, and *Emotional Response*).

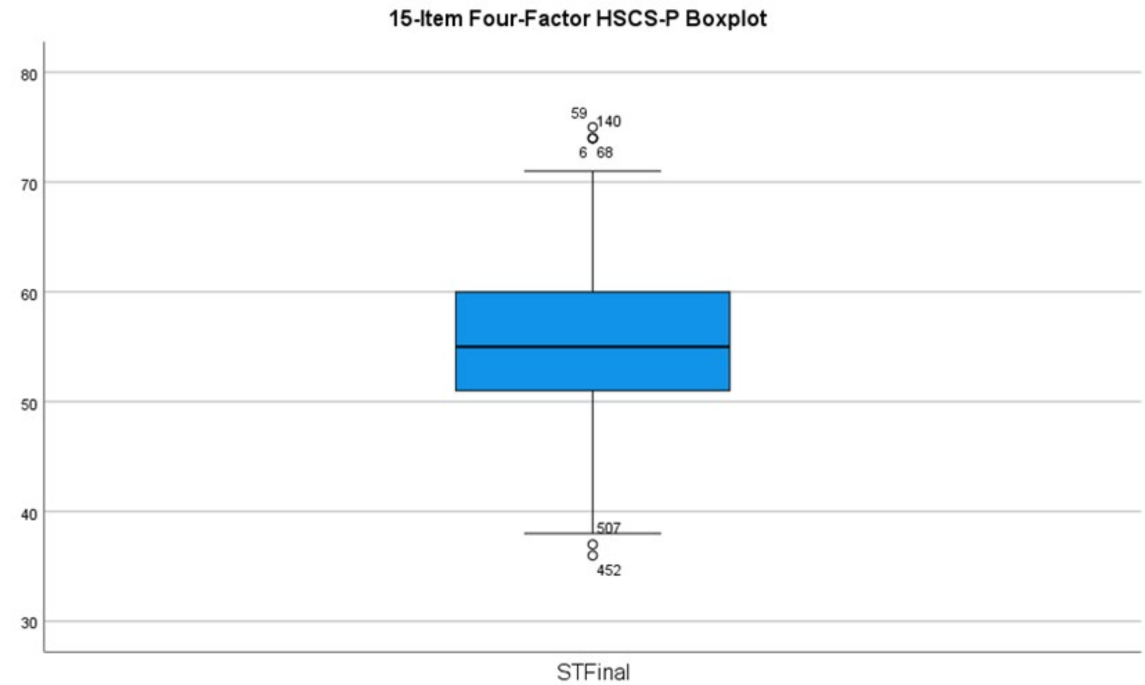

Figure 12. *Final HSPS Boxplot*

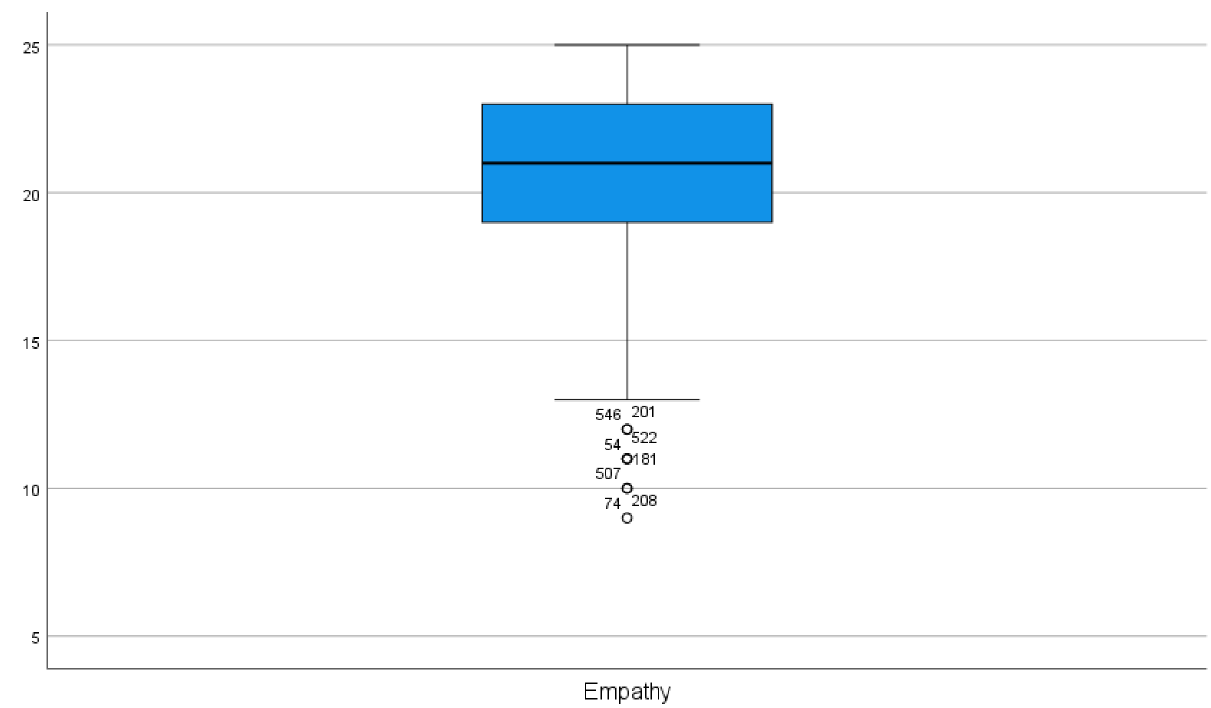

Figure 13. *Final Empathy Subscale Boxplot*

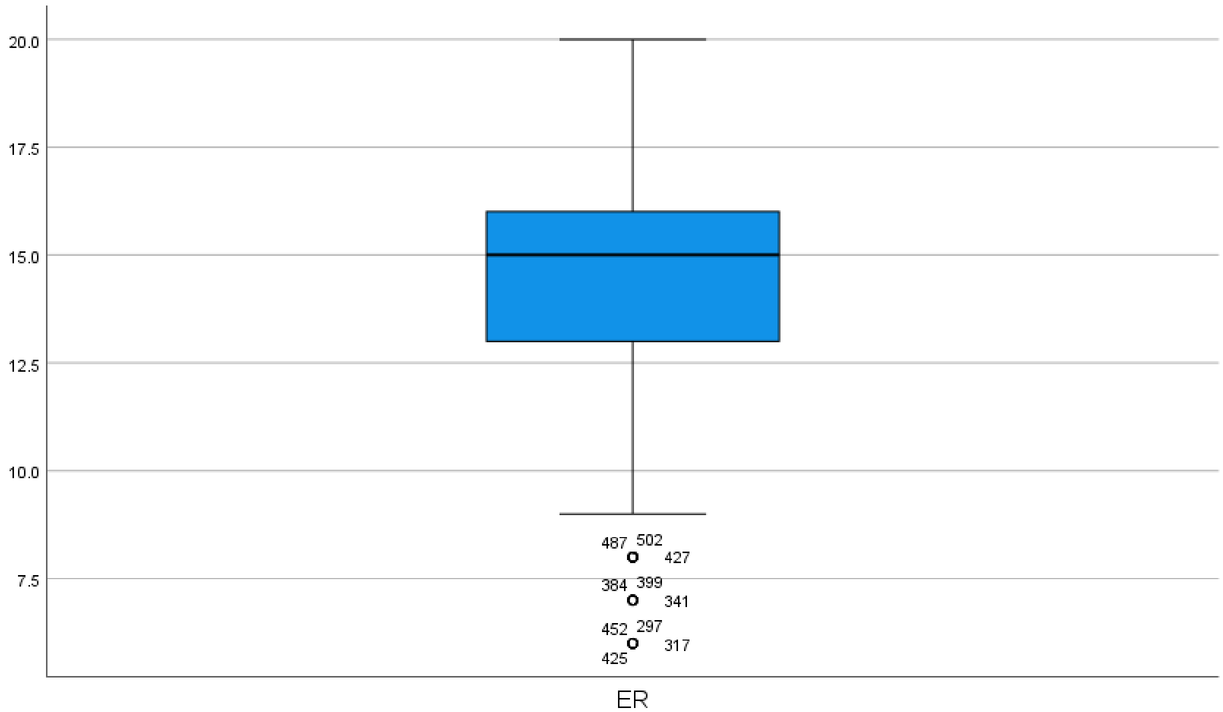

Figure 14. *Final Emotional Response Subscale Boxplot*

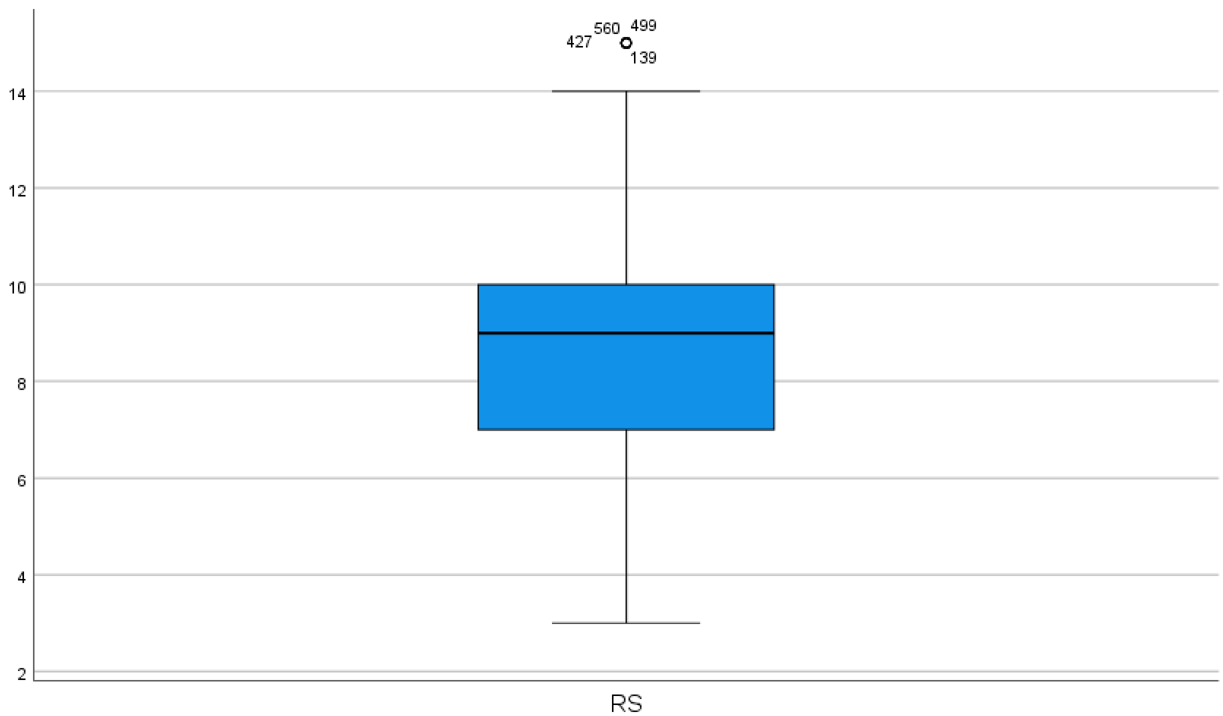

Figure 15. *Final Response to Stimuli Subscale Boxplot*

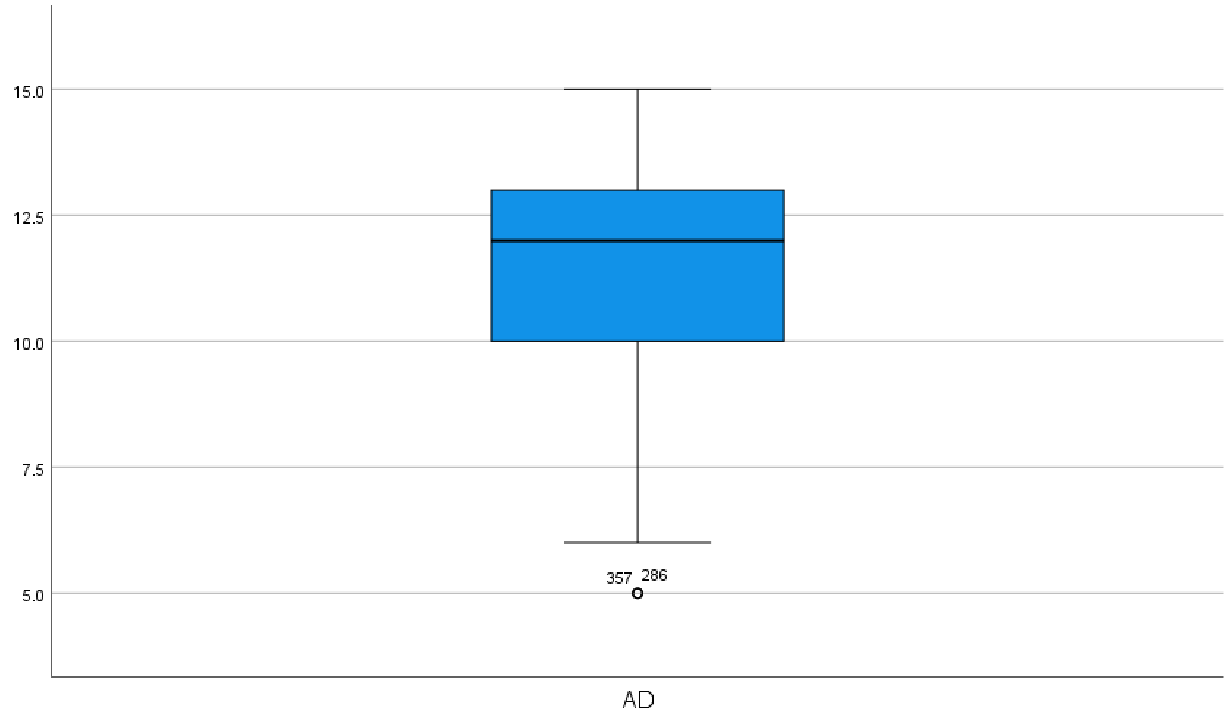

Figure 16. *Final Attention to Detail Subscale Boxplot*

Additionally, the researcher converted standardized *z* scores of the overall scales and four subscales and identified any values ± 3.0 (Osborne, 2013). Using the standardized *z* cut off score of ± 3.0 (Osborne, 2013) to identify univariate outliers, the researcher deemed one case (0.12%) of total scale HSPS, 5 cases (0.87%) of the total *Empathy* subscale, no cases (0 %) of the total *Response to Stimuli* subscale, 3 cases (0.52%) of the total *Attention to Detail* subscale, and 2 cases (0.35%) of the total *Emotional Response* subscale. After the researcher omitted the 11 cases, from the original sample of $N = 577$, the sample size of $N = 566$ was retained. The researcher then explored assumptions of normality by looking at how outliers impacted the distribution of data, using both the Kolmogorov-Smirnov and Shapiro-Wilk tests (see Table 16). The final HSPS showed non-significance, and therefore met the assumption of normality while all subscales showed significance ($p < .0001$), not meeting the assumption of normality.

Table 16.

Tests of Univariate Normality

Scale	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	*df*	*Sig*.	Statistic	*df*	*Sig.*
HSPS	.056	566	.000	.996	566	.135
Empathy	.097	566	.000	.962	566	.000
Response to Stimuli	.085	566	.000	.981	566	.000
Attention to Detail	.130	566	.000	.961	566	.000
Emotional Response	.019	566	.000	.965	566	.000

Based on the violation of univariate normality for the four HSPS subscales, the researcher continued with one additional test, the Mahalanobis distance (3.933) at a probability of $p < .001$, to assess multivariate normality. The researcher identified one case that contained a multivariate outlier. To test the impact the outlier had on the normal distribution of data, the researcher removed the single case and found that neither statistical tests (Shapiro-Wilk and Kolmogorov-Smirnov) nor visual inspections of the data (histogram and Q-Q plots) showed any improvement regarding the normality of the data. Researchers have found that for larger samples (e.g., > 200) multivariate outliers are common; and at times, removal of outliers do not improve the accuracy of data analysis (Osborne, 2013; Tabachnick & Fidell, 2013). Based on both the scholarly insights and the fact that the removal of the one multivariate outlier did not improve univariate normality, the researcher decided to retain the single multivariate outlier.

In summary after deletion of univariate outliers across 11 cases from the original useable sample (*N* = 577) to address normality, the final sample size was (*N* = 566). The sample size of *N* = 566 exceeded the minimum to conduct a MANOVA (*n* = 132), for RQ 4.

The researcher then reviewed the assumption of linearity through visual inspection of scatterplots, looking at the linear relationship between each DV (subscale), including the covariate (HSPS total score), and found all pairings to be linear in nature (Pallant, 2020). To assess for multicollinearity, the researcher ran a multiple regression for each item on the HSPS using the remaining items as the independent variable. Then the researcher evaluated each item, using the variance inflation factor (VIF) and the Tolerance value. A VIF value < 10 and Tolerance value > 0.10 indicates no multicollinearity (Hahs-Vaughn, 2017). After running all 15 logistical regressions, the researcher found no evidence of violation in the assumption of multicollinearity.

Finally, the researcher tested the assumption of homogeneity of variance-covariance matrices wherein both the Box's M test and Leven's test if Equality of Error Variance was non-significant ($p > .001$) for each demographic variable (Tabachnick & Fidell, 2013). To test the assumption of homogeneity of regression slopes, the researcher considered if each independent variable had a statistically non-significant relationship with the covariate (total score). Using Wilks' λ, the researcher found that both race ($F = 1.668$, $p < .05$, Wilks' $\lambda = .936$, partial $\eta 2 = .022$) and education ($F =1 .636$, $p < .05$, Wilk's $\lambda = .937$, partial $\eta 2 = .022$) had significant interactions with the covariate (total score). Based on the statistically significant differences in participant total scores across the race and education, the researcher determined a lack of homogeneity of regression slopes. Due to the absence of homogeneity, the researcher proceeded by using a one-way MANOVA instead of a MANCOVA.

One-Way MANOVA. The researcher ran a one-way MANOVA on several demographic variables and only found statistically significant group differences on variables related to the caregiver's demographics when considering subscale scores on the HSPS. Specifically, the researcher found group difference across caregiver race, gender, and education. The researcher considered both statistical significance ($p < .05$) and practical significance (i.e., small effect size, $\eta2 \geq .01$, medium effect, $\eta2 \geq 0.06$, large effect, $\eta2 \geq 0.14$; Hahs-Vaughn, 2017) when she considered group differences. Next, the researcher discussed each of the statistical analyses for each demographic variable.

Caregiver Race. The researcher looked to see if a statistically significant difference existed between race of caregiver (Caucasian, n = 414; Black or African American, n = 37; Asian, n = 48; American Indian or Alaska Native, n = 19; Native Hawaiian or Pacific Islander, n = 2; Bi-racial/ Multiracial, n = 21; or Other, n = 15) and subscale scores on the HSPS. The researcher identified a statistically significant group difference based on the participants' race ($F = 1.72$, $p < .05$, Wilk's $\lambda = .928$, partial $\eta2 = .019$), indicating a small effect size. Using a post hoc ANOVA, the researcher found a statistically significant group difference for *Emotional Response* with a small effect size ($F = 2.663$, $p < .05$, $\eta2 = .028$), evident by Black or African American participants scoring lower on *Emotional Response* (M = 12.73, SD = 3.05) compared to all other races represented in the study, with the highest being Caucasian (M = 14.57, SD = 2.68; see Figure 17). Additionally, the lack of group differences across other races, expect Caucasian, Black or African American, and Asian, could be due to the small sample size, which only allowed the researcher to detect very large effect sizes.

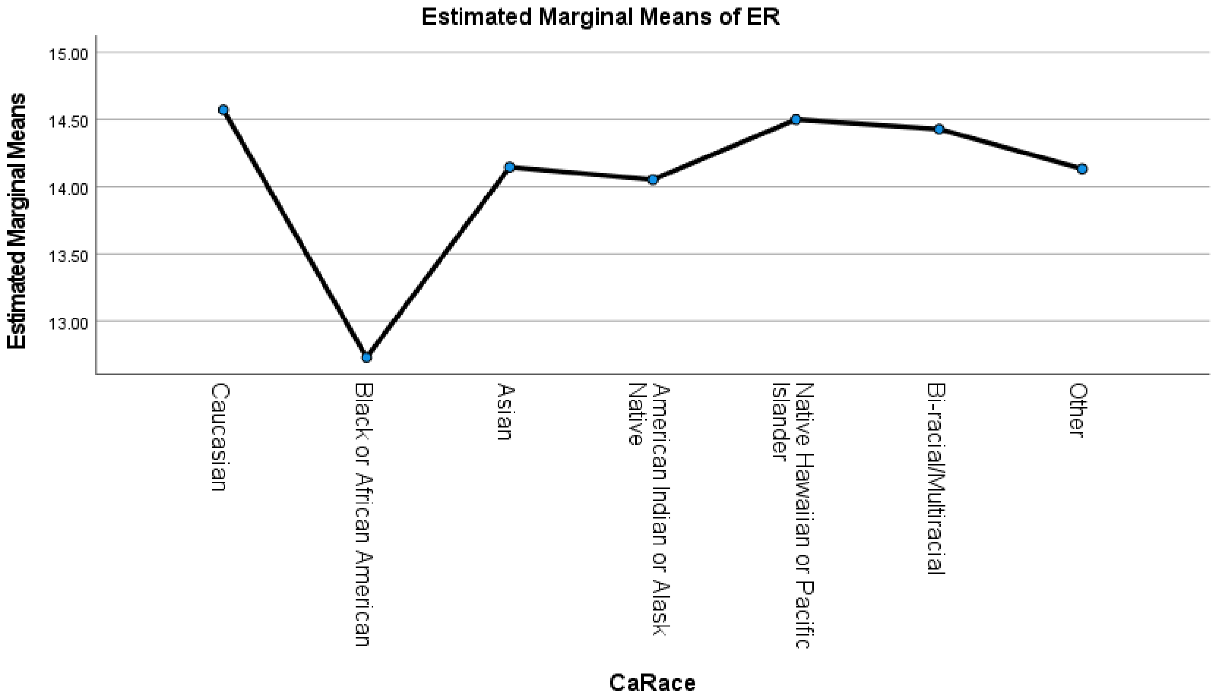

Figure 17. *Marginal Means of Emotional Response Scores*

Caregiver Gender. The researcher looked to see if a statistically statistical difference existed between caregiver gender (Female, n = 440; and Male, n = 116) and subscale scores on the HSPS. The researcher identified a statistically significant group difference based on the participants' gender ($F = 3.799$, $p < .05$, Wilk's $\lambda = .973$, partial $\eta 2 = .027$), indicating a small effect size. Using a post hoc ANOVA, the researcher found a significant group difference across caregiver gender for *Empathy* with a small effect size ($F =5.977$, $p < .05$, $\eta 2 = .011$), evident by Female participants scoring higher on *Empathy* (M = 20.63, SD = 3.13) compared to Male participants (M = 19.86, SD = 2.41; see Figure 18). Additionally, the researcher found a statistically significant group difference across caregiver gender for *Response to Stimuli* with a very small effect size ($F =4.232$, $p < .05$, $\eta 2 = .008$), evident by Female participants scoring lower on *Response to Stimuli* (M = 8.55, SD = 2.58) compared to Male participants (M = 9.09, SD = 2.02; see Figure 19).

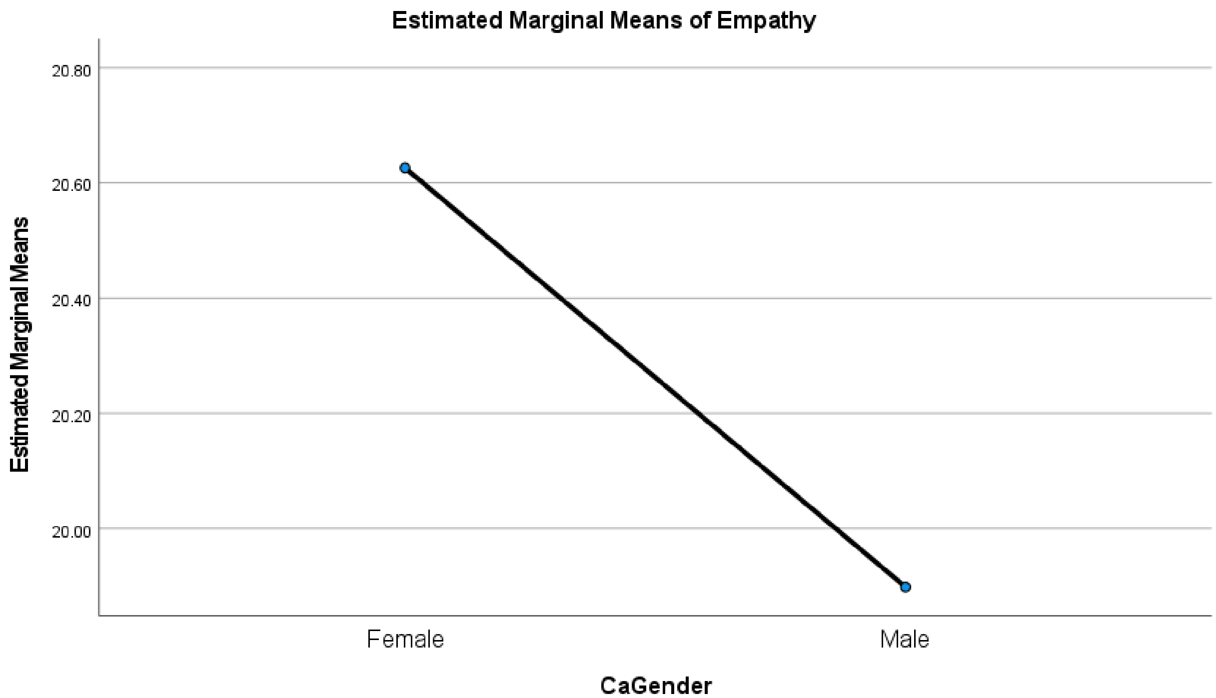

Figure 18. *Marginal Means of Empathy Score*

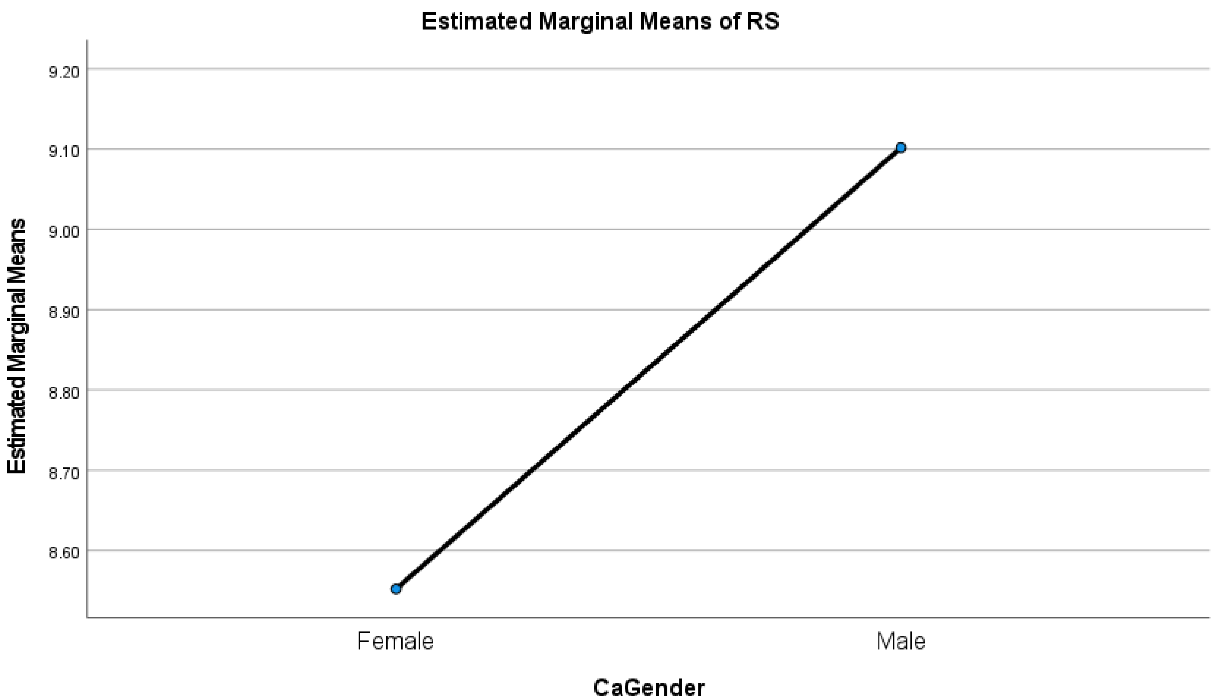

Figure 19. *Marginal Means of Response to Stimuli Score*

Caregiver Education. The researcher looked to see if a statistical difference existed between caregiver education (High school diploma/GED, n = 111; Vocational/Technical Certification, n = 24; Associate Degree, n = 58; Bachelor's Degree n = 191; Master's Degree/Advanced Degree, n = 162; No Degree or Diploma, n = 8; or Other, n = 2) and subscale scores on the HSPS. The researcher identified a statistically significant group difference based on the participants' education ($F = 2.092$, $p < .05$, Wilk's $\lambda = .913$, partial $\eta 2 = .022$), indicating a small effect size. Using a post hoc ANOVA, the researcher found a significant group difference across caregiver education for *Emotional Response* with a small effect size ($F =3.650$, $p < .05$, $\eta 2 = .038$), evident by caregivers with no degree or diploma scoring higher than any other educational group on *Emotional Response* (M = 15.5, SD = 2.67) compared to the lowest scoring educational group, Associate Degree (M = 13.55, SD = 2.82; see Figure 20). Finally, the researcher found a statistically significant group difference found across caregiver education for *Response to Stimuli* with a small effect size (F =3.048, $p < .05$, $\eta 2 = .032$), evident by caregivers with a Vocational/Technical Certification scoring lower than any other educational group on *Response to Stimuli* (*M* = 7,56, *SD* = 2.10) compared to the highest scoring educational group, Master's Degree / Advanced Degree (*M* = 9.13, *SD* = 2.48; see Figure 21).

Although the researcher identified significant group differences across different caregiver demographics and subscale scores, the effect sizes were small, indicating that a larger diverse sample could strengthen overall results and understanding of how SPS is perceived by a wide range of caregivers.

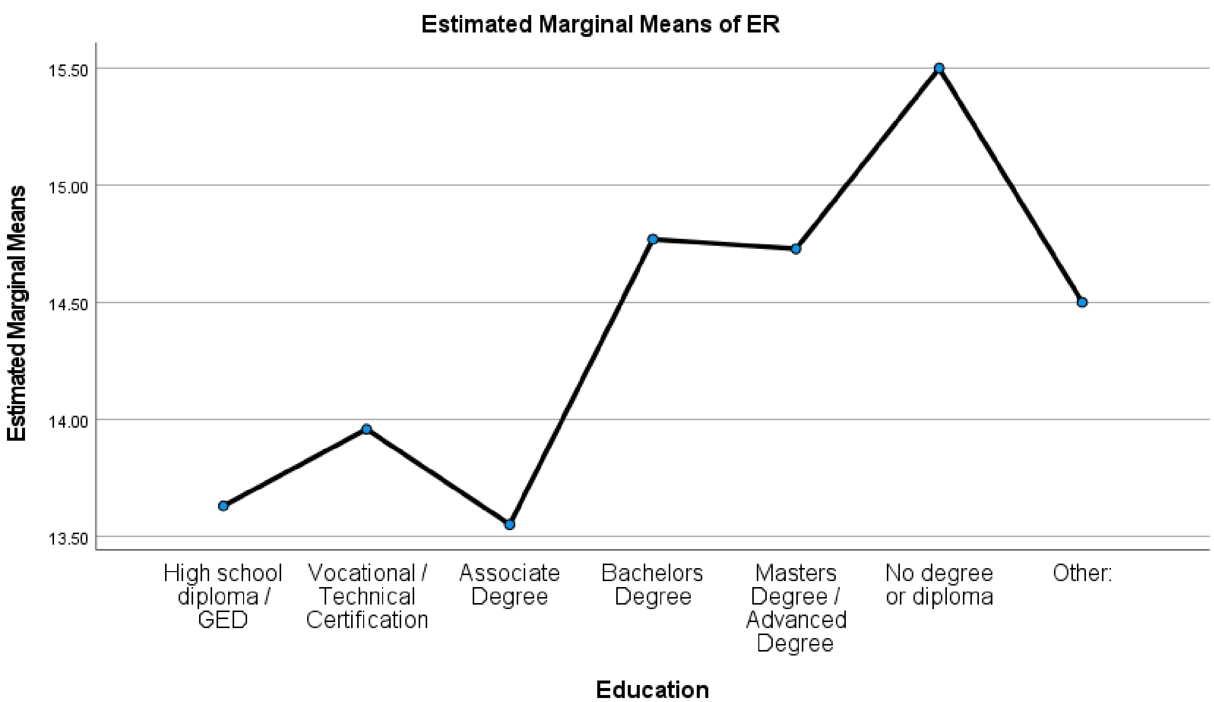

Figure 20. *Marginal Means of Emotional Response Score*

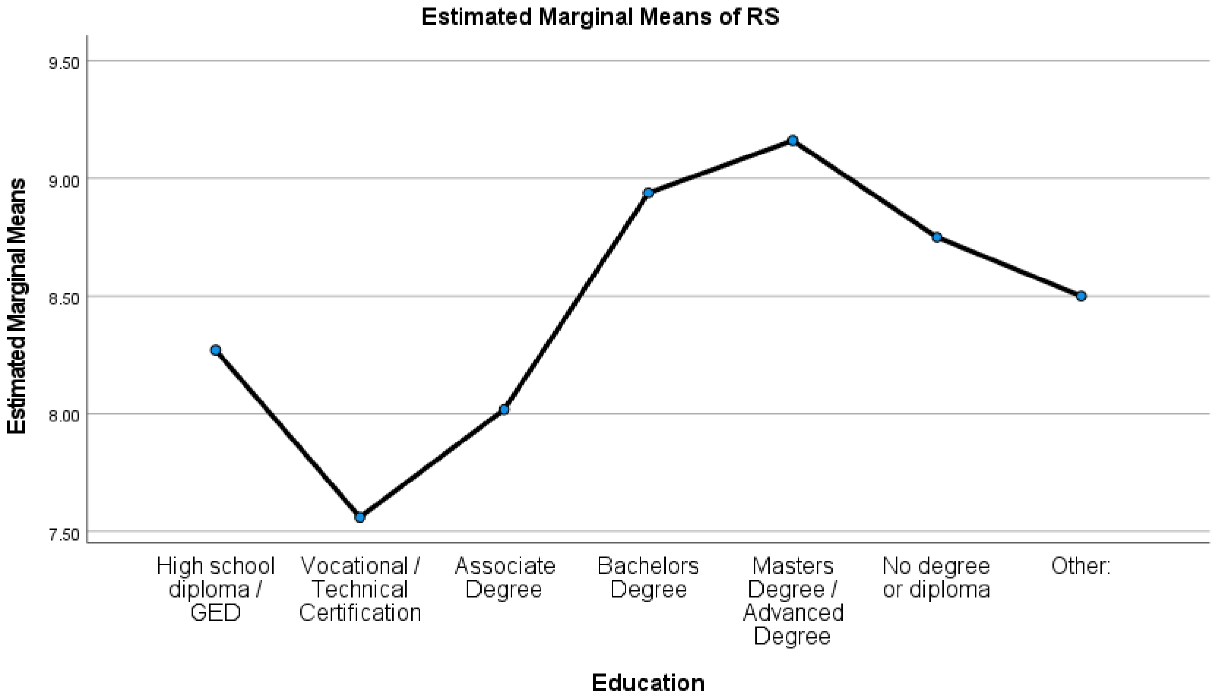

Figure 21. *Marginal Means of Response to Stimuli*

Research Question 5

To address research question five, the researcher administered the HSPS twice to a self-selected sample across two weeks to (a) examine test-retest reliability, (b) assess if the highly sensitive trait remained constant over time, and (c) identify if error exists in the stability of the developed HSPS scale. Finally, to answer research question five, the researcher (a) considered assumptions to conduct a Pearson product-moment correlation, and then (b) examined the test-retest reliability of the HSPS using a Pearson product-moment correlation.

Assumptions. In determining the presence of univariate outliers, the researcher converted standardized *z* scores for both the first and second online administration of the HSPS and identified any values ± 3 (Osborne, 2013). Using the standardized *z* cut off score of ± 3.0 (Osborne, 2013), the researcher deemed one case (0.01%) on the HSPS (first administration) as an outlier across the first and second administration of the HSPS. In addition to the *z* scores, the researcher utilized histograms, Q-Q plots, and boxplots (see Figures 22-50), to visually assess distribution of scores and determine outliers in the data. The researcher then ran both the Kolmogorov-Smirnov and Shapiro-Wilk tests of normality and found statistical insignificance across both scales and therefore could assume the assumption of normality (Hahs-Vaughn, 2017; see Table 18).

Table 17.

Tests of Univariate Normality

Scale	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	*df*	Sig.	Statistic	*df*	Sig.
HSPS Total 1	.075	97	.200	.980	97	.183
HSPS Total 2	.101	97	.097	.896	97	.172

To identify outliers, the researcher reviewed boxplots to assess if any values fell far from the box (e.g., median). The researcher considered the normal distribution based on the histogram, a visual representation of the data's distributional shape (Hahs-Vaughn, 2017). Finally, the researcher assessed if the deletion of the one case with a univariate outlier improved the tests of univariate normality. Since the omission of the case did not improve overall normality of the scores the researcher chose to retain the case and therefore, had a total sample of $N = 97$ participants.

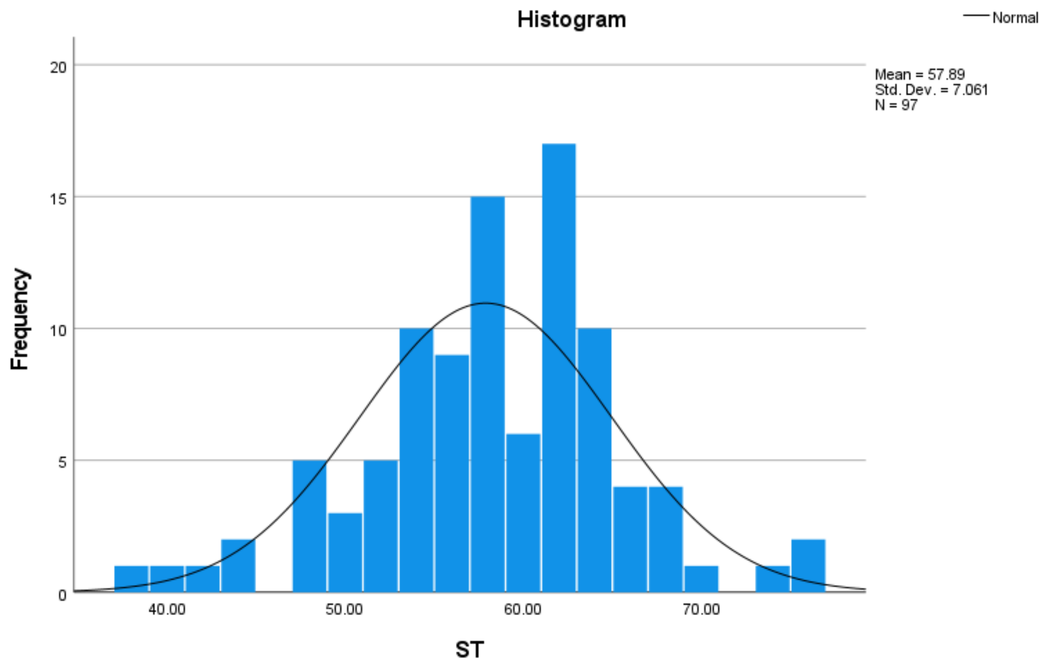

Figure 22. *Total HSPS Histogram*

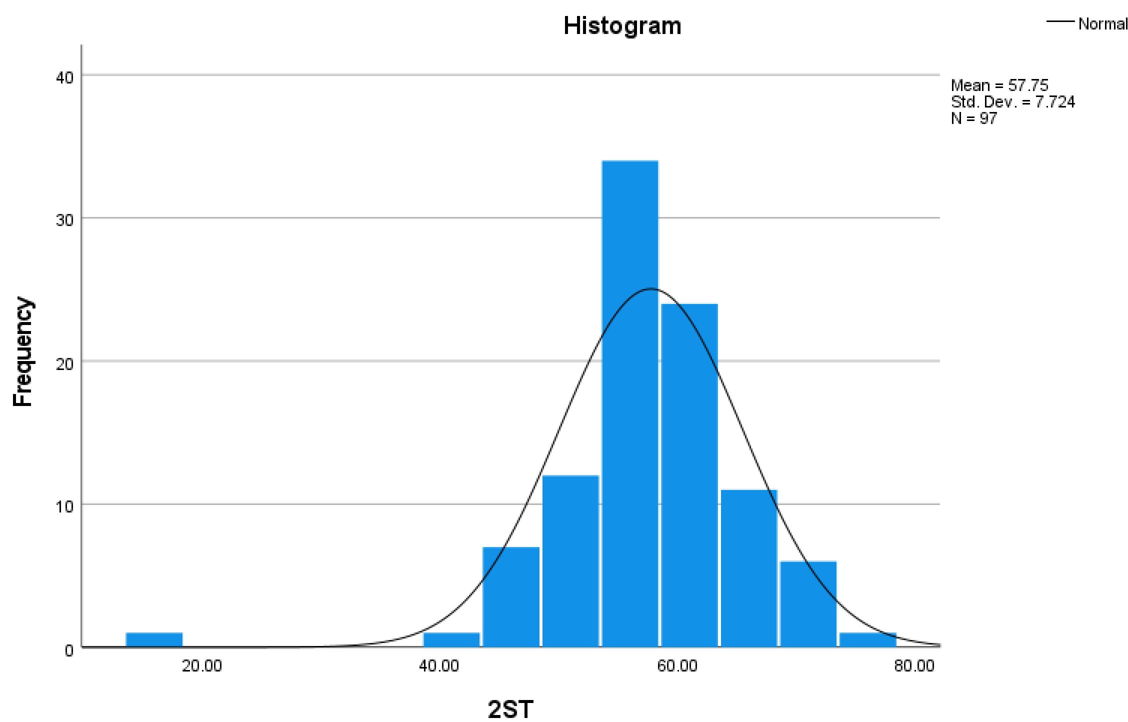

Figure 23. *Total HSPS Retest Histogram*

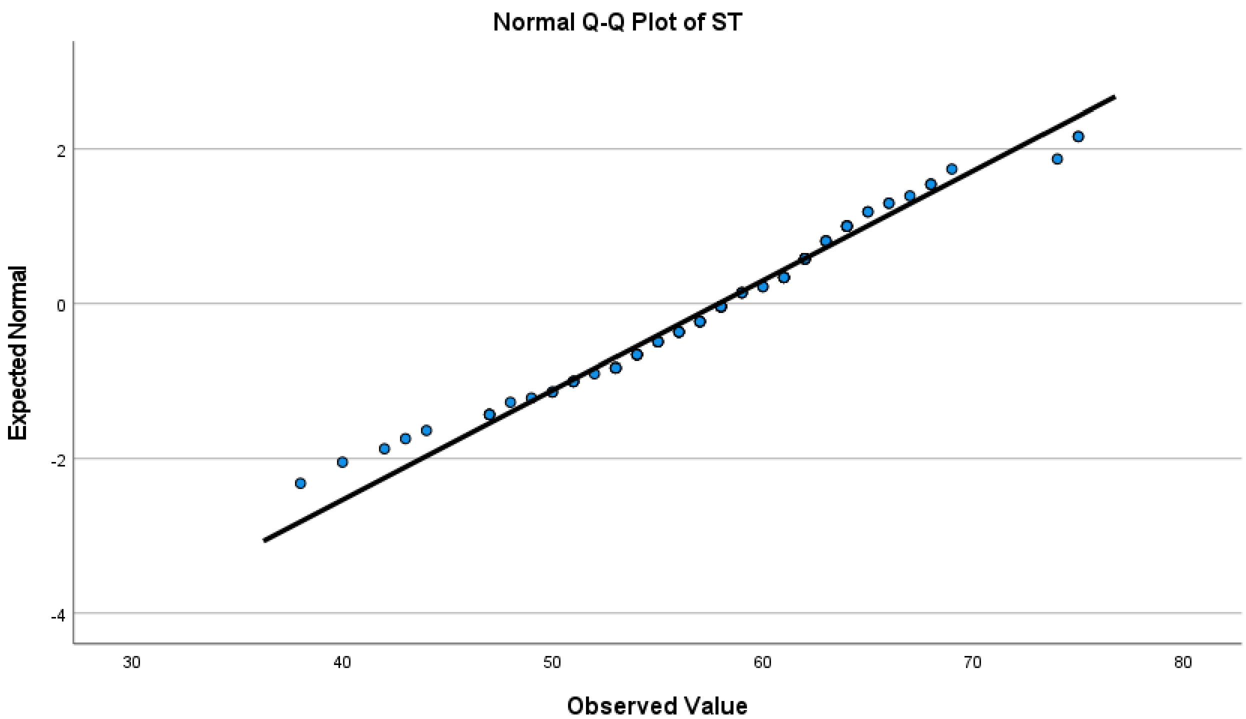

Figure 24. *Total HSPS Q-Q Plot*

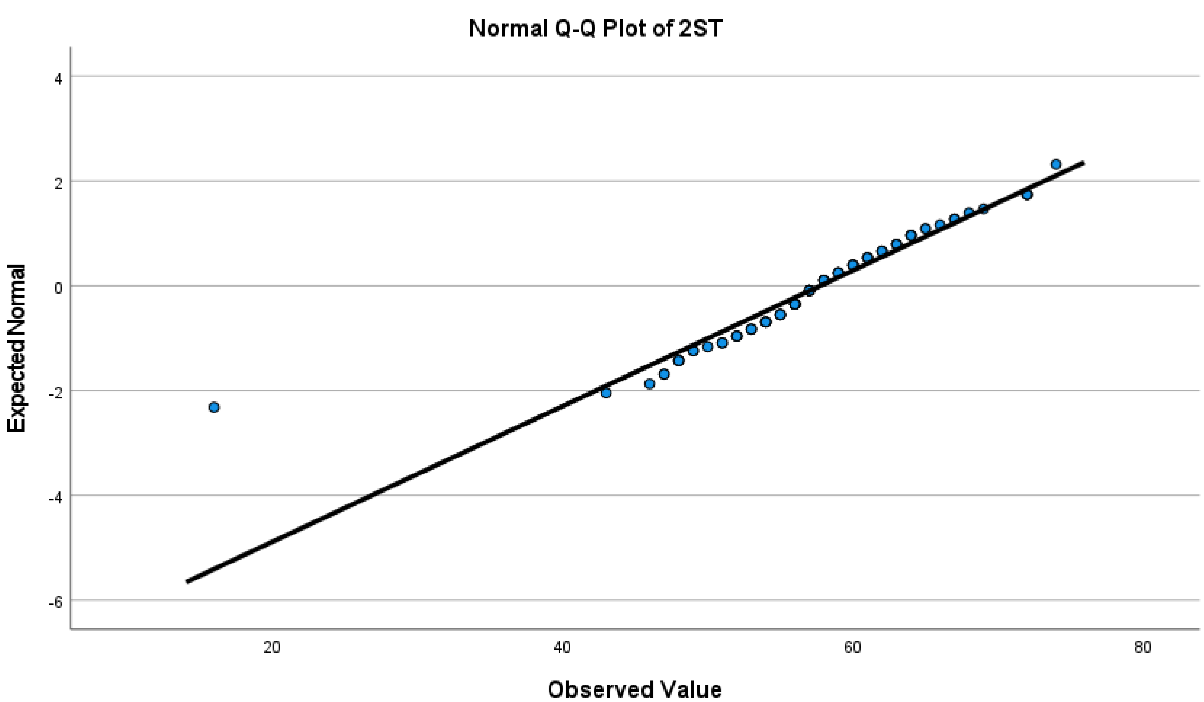

Figure 25. *Total HSPS Retest Q-Q Plot*

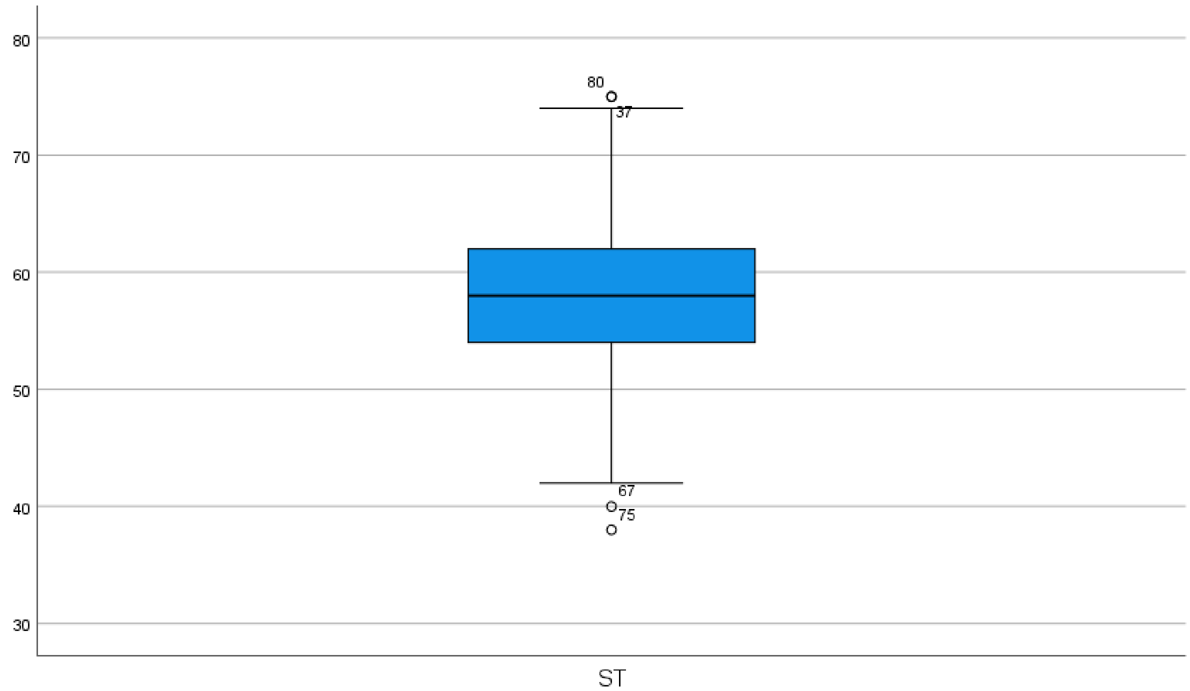

Figure 26. *Total HSPS Boxplot*

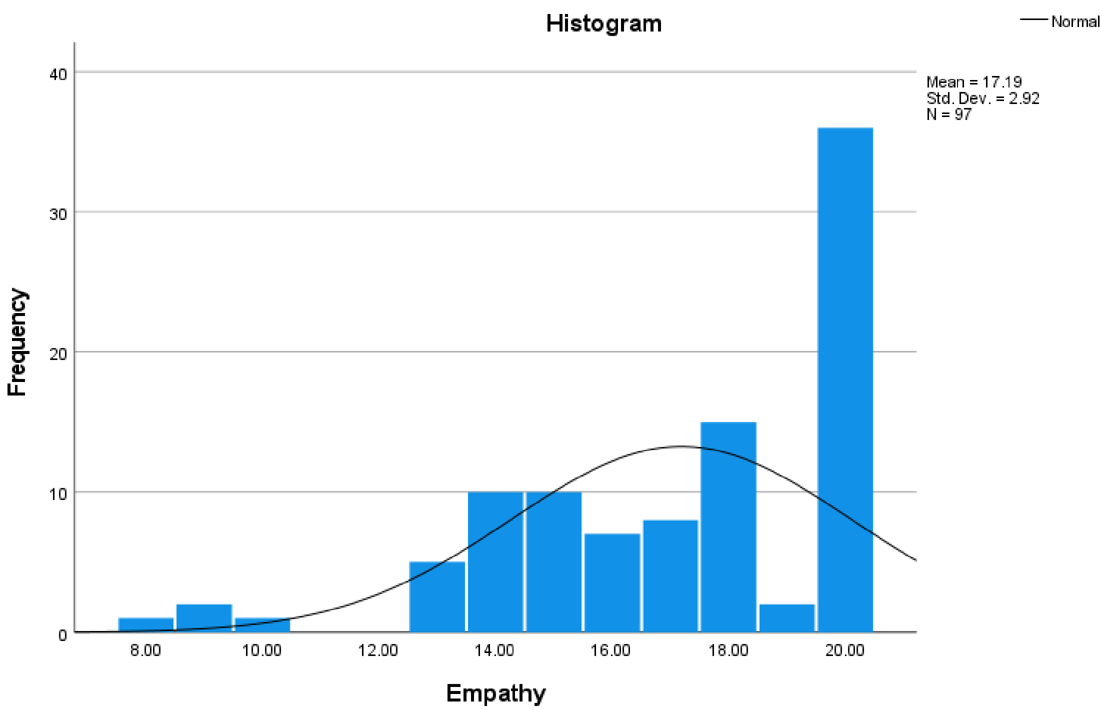

Figure 27. *Empathy Histogram*

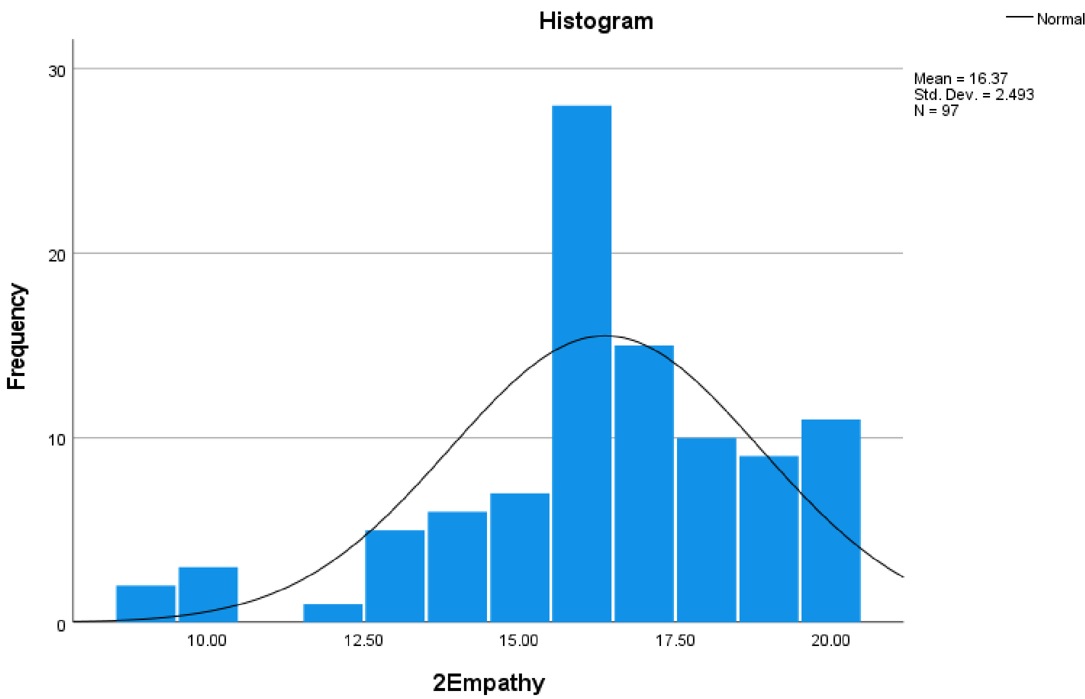

Figure 28. *Empathy Histogram*

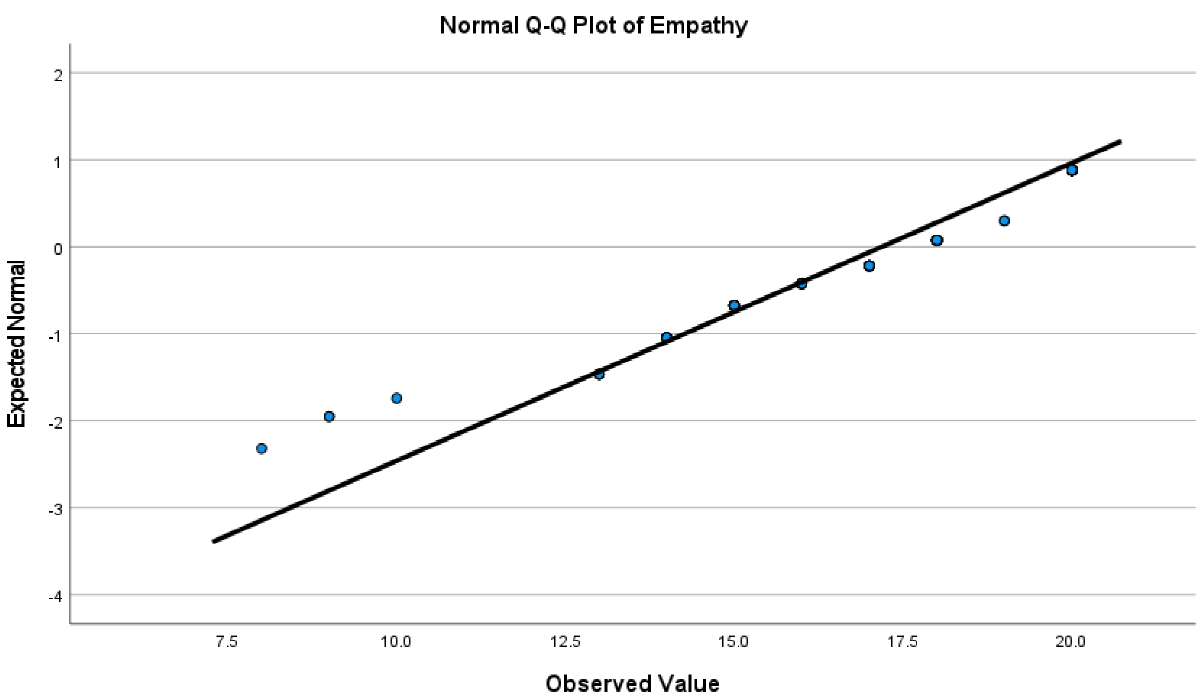

Figure 29. *Empathy Retest Q-Q Plot*

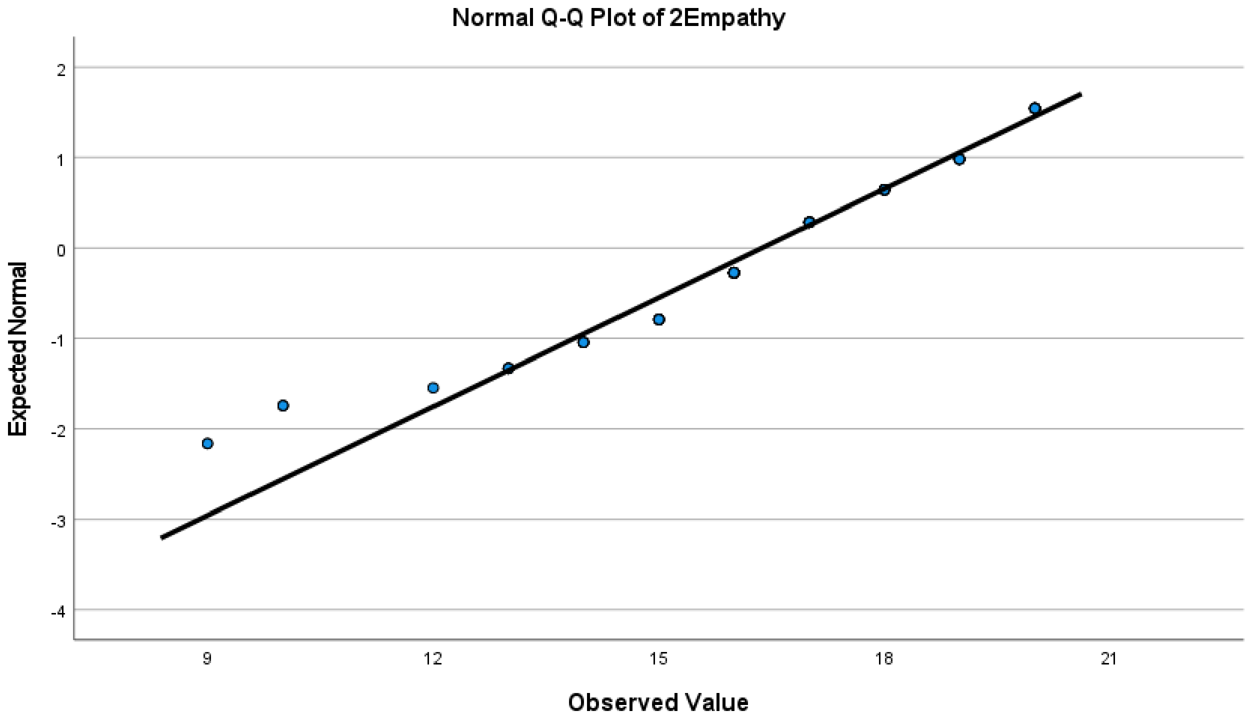

Figure 30. *Empathy Retest Q-Q Plot*

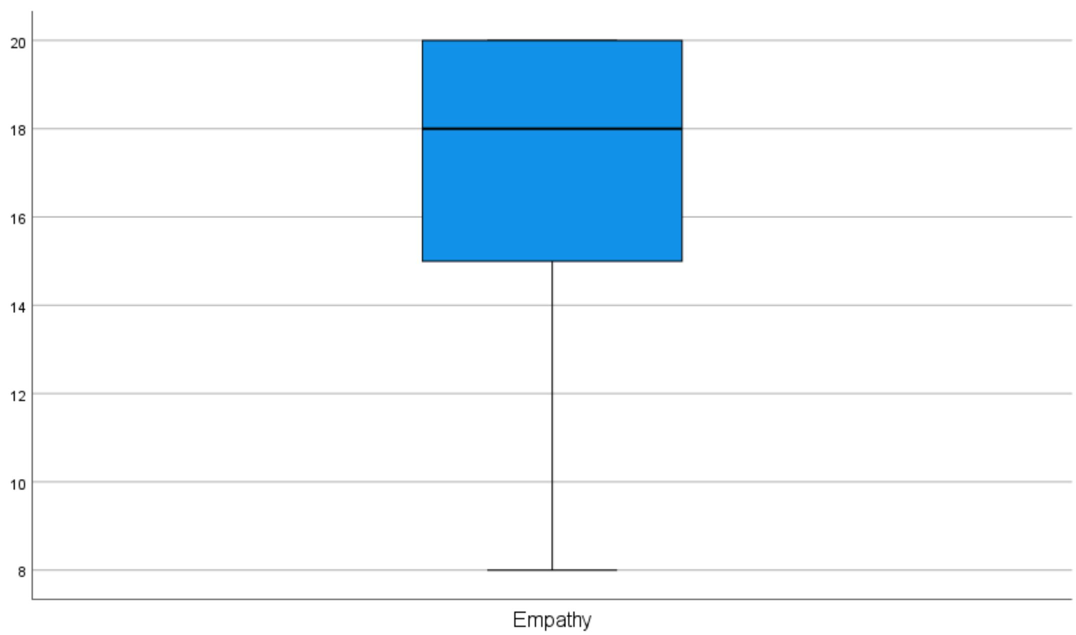

Figure 31. *Empathy Boxplot*

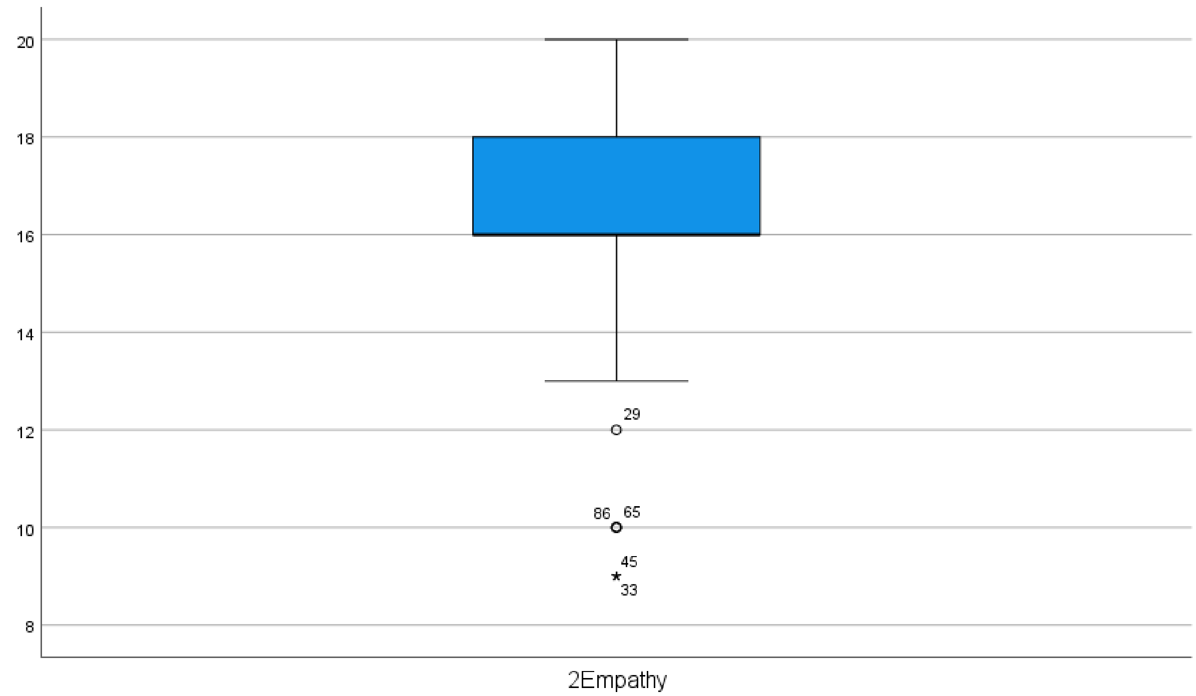

Figure 32. *Empathy Retest Boxplot*

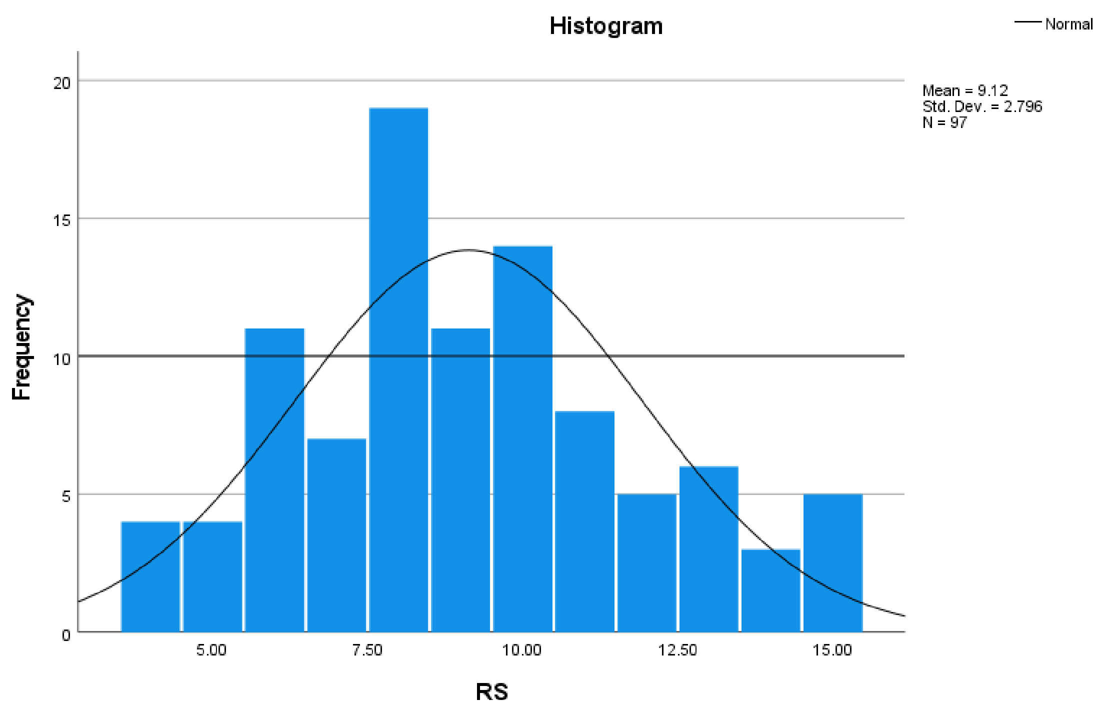

Figure 33. *Response to Stimuli Histogram*

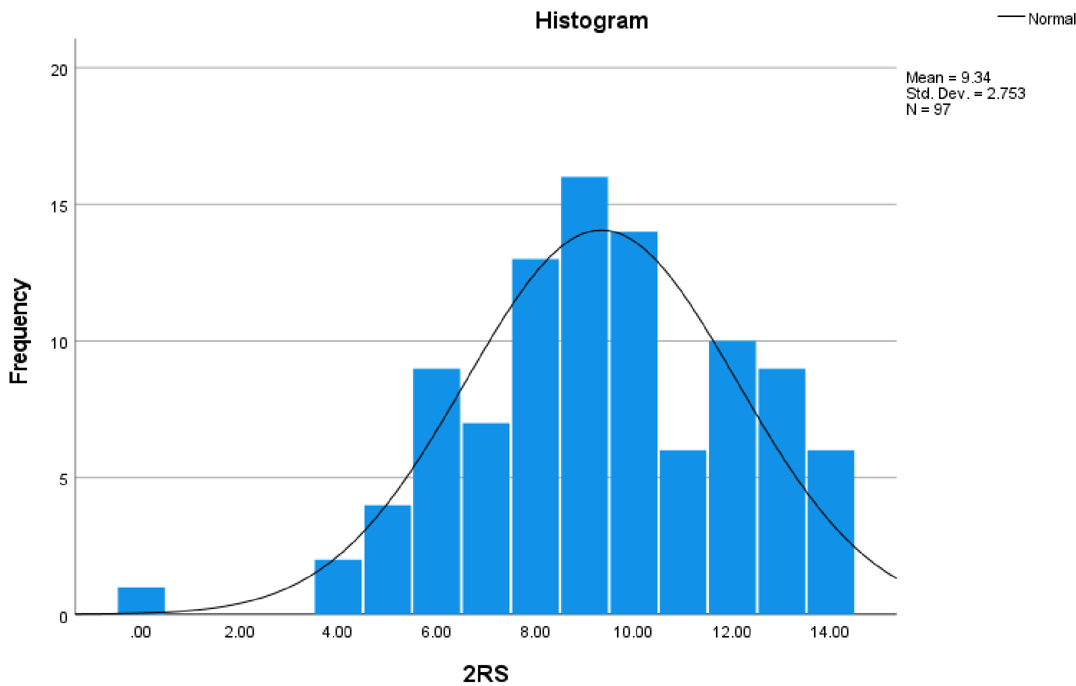

Figure 34. *Response to Stimuli Retest Histogram*

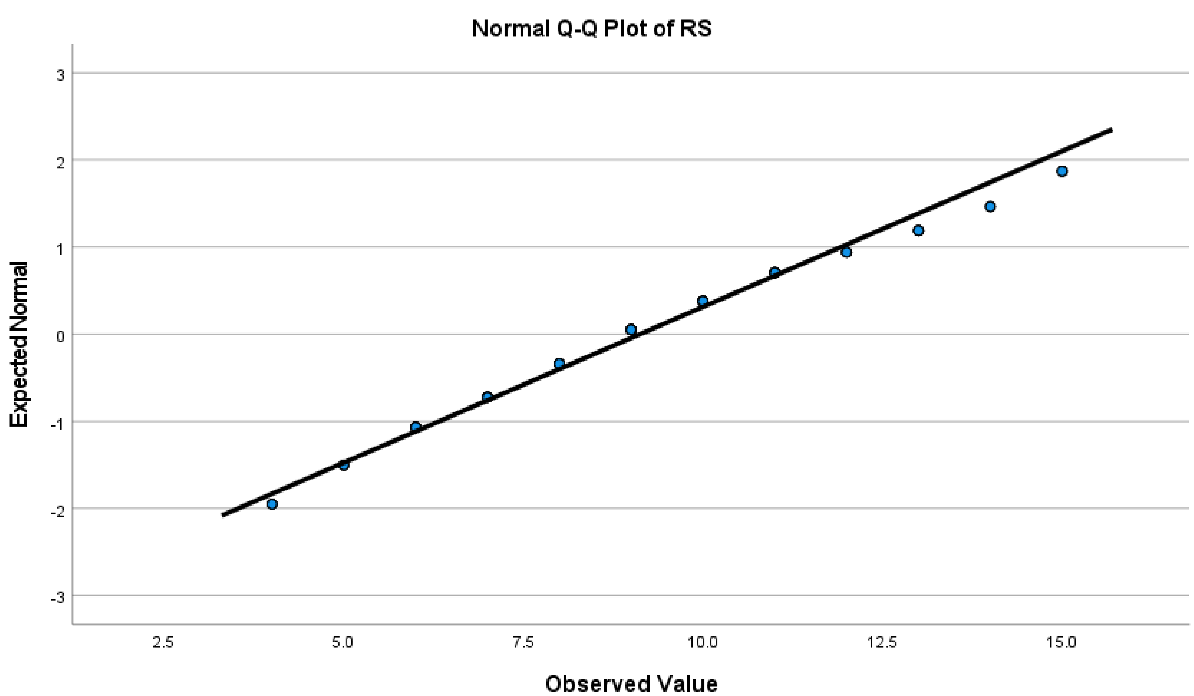

Figure 35. *Response to Stimuli Q-Q Plot*

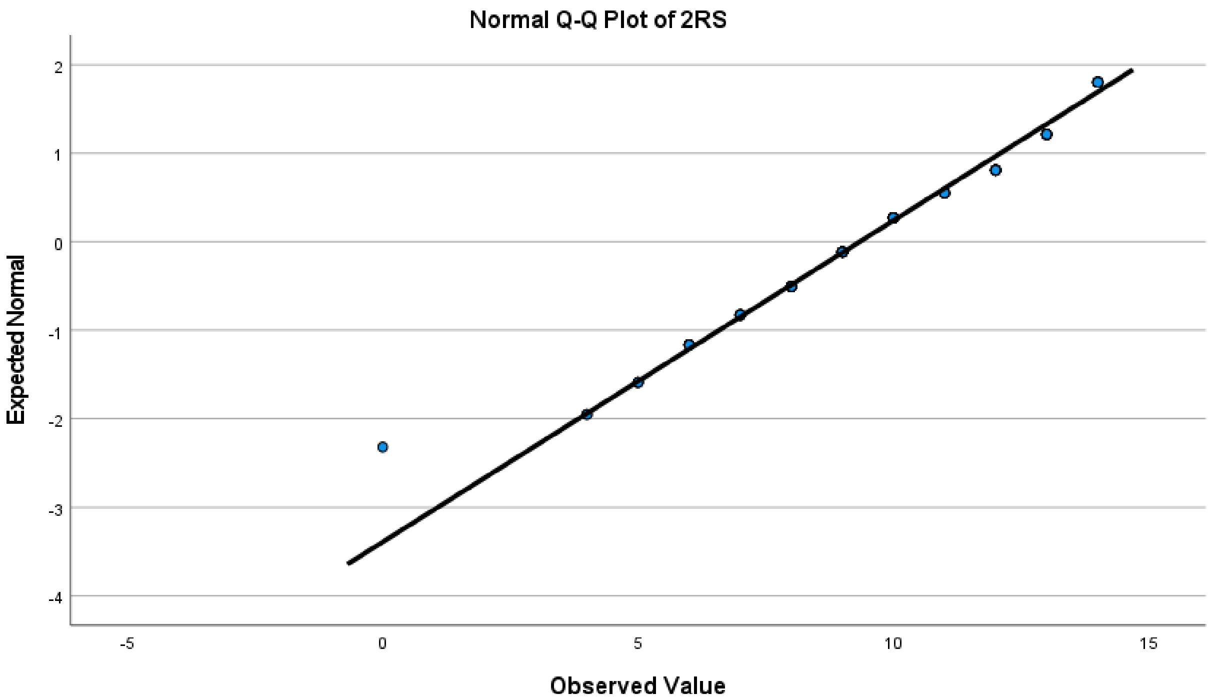

Figure 36. *Response to Stimuli Retest Q-Q Plot*

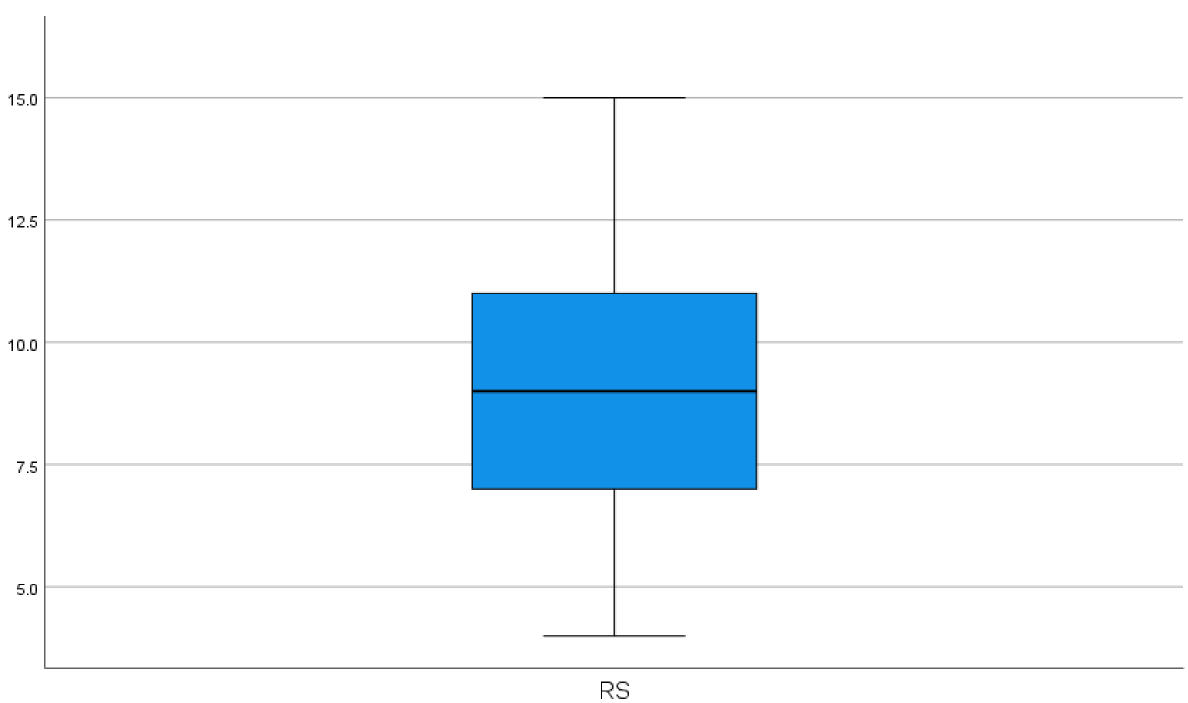

Figure 37. *Response to Stimuli Boxplot*

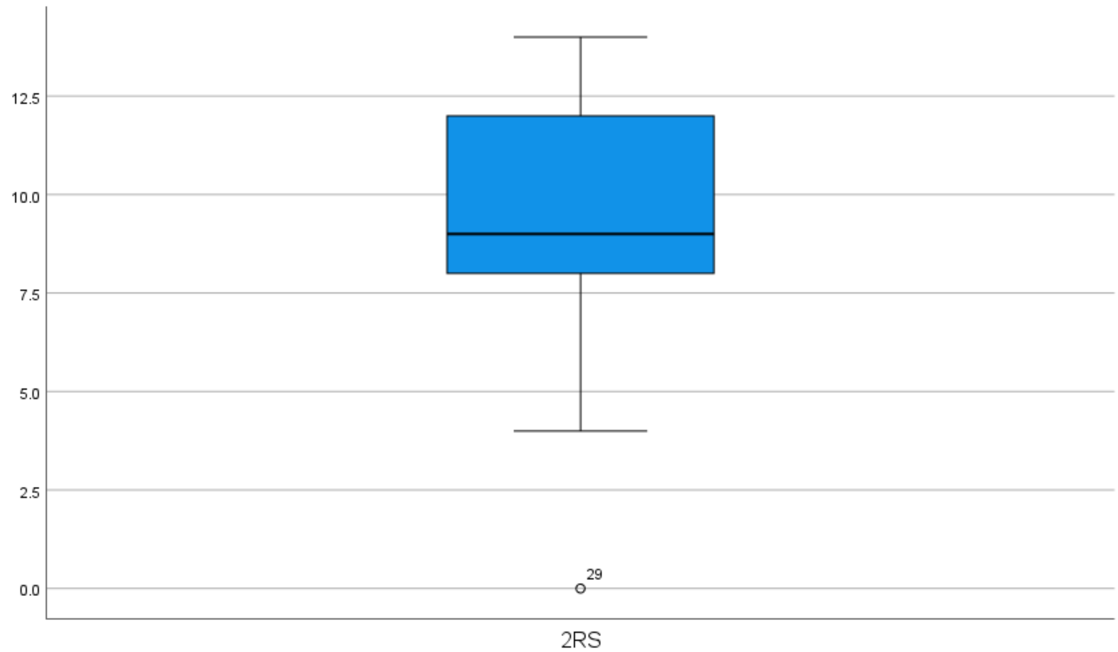

Figure 38. *Response to Stimuli Retest Boxplot*

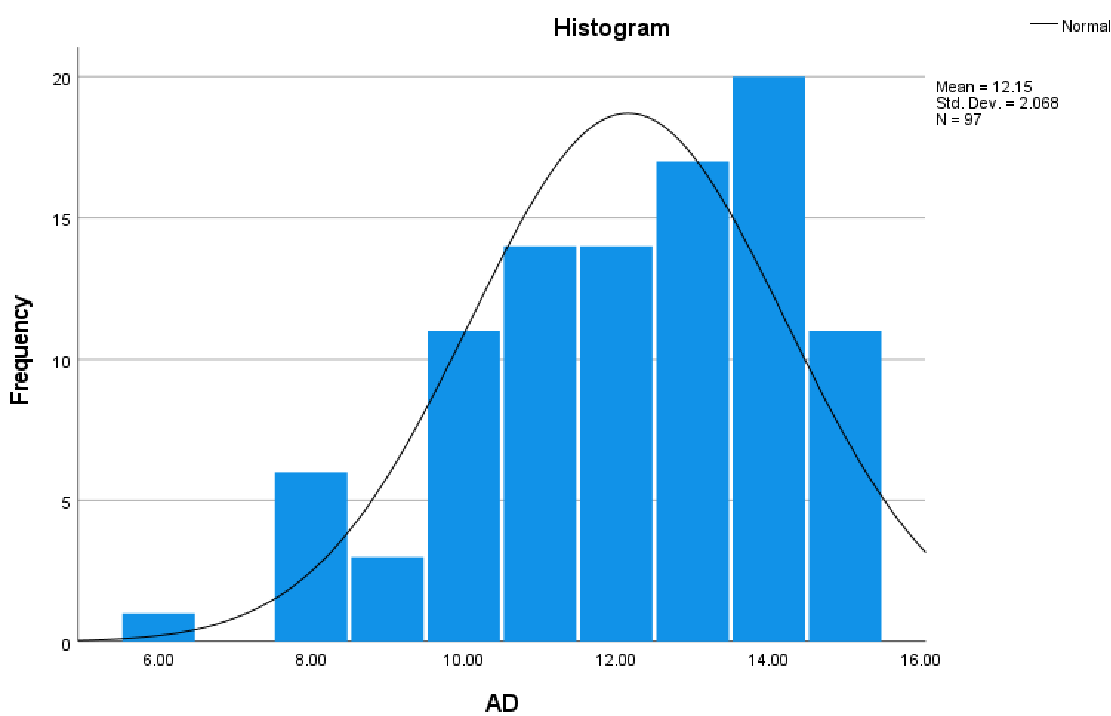

Figure 39. *Attention to Detail Histogram*

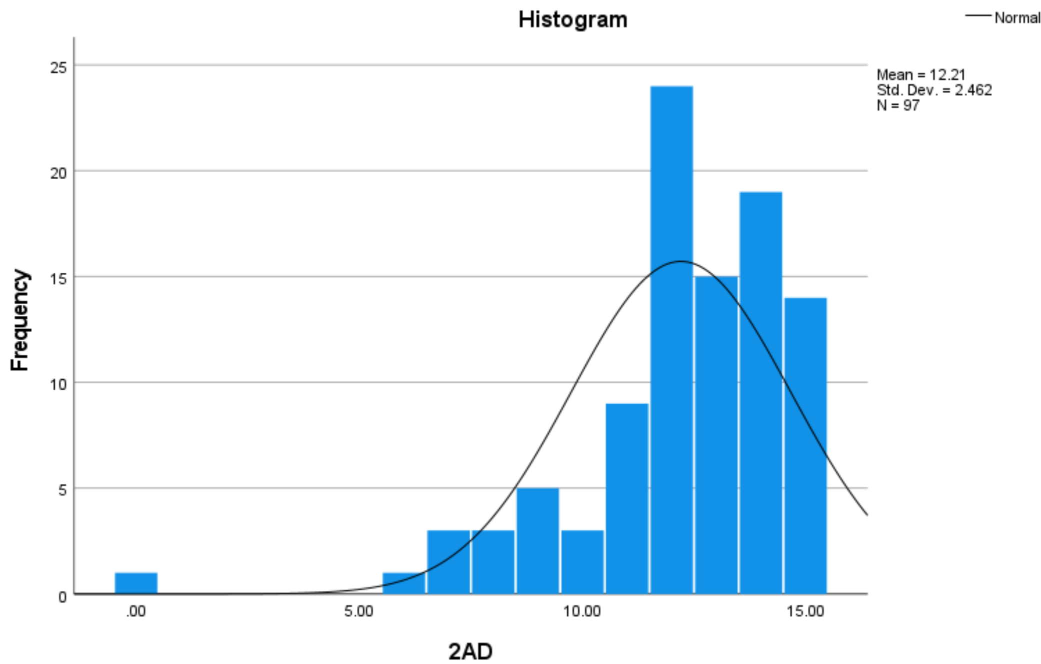

Figure 40. *Attention to Detail Histogram*

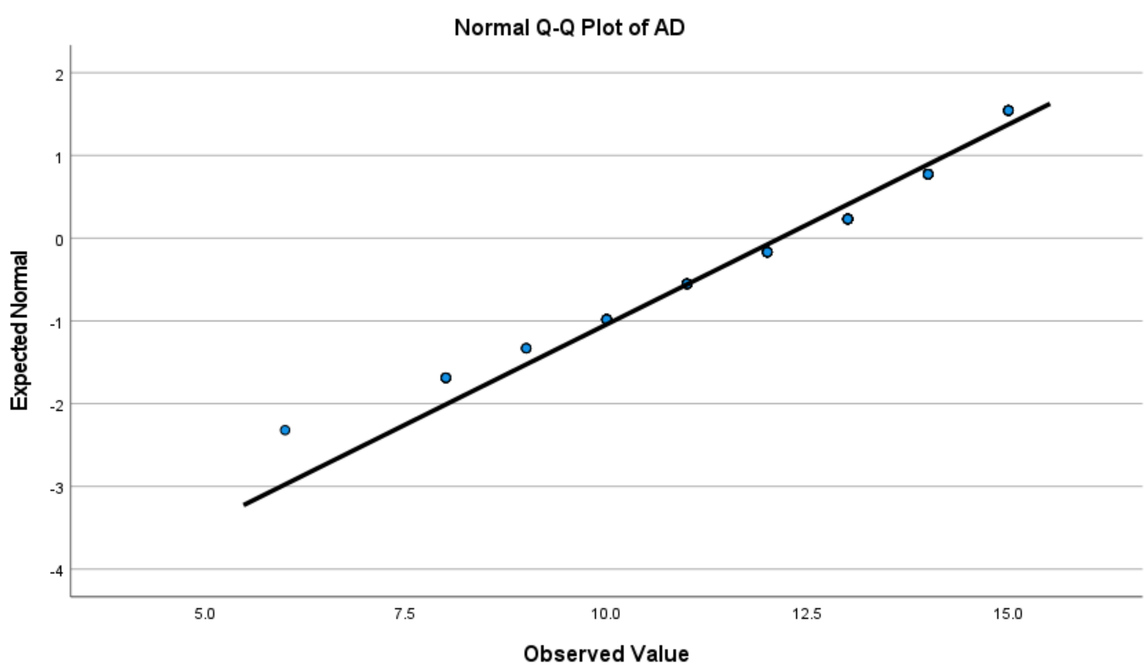

Figure 41. *Attention to Detail Retest Q-Q Plot*

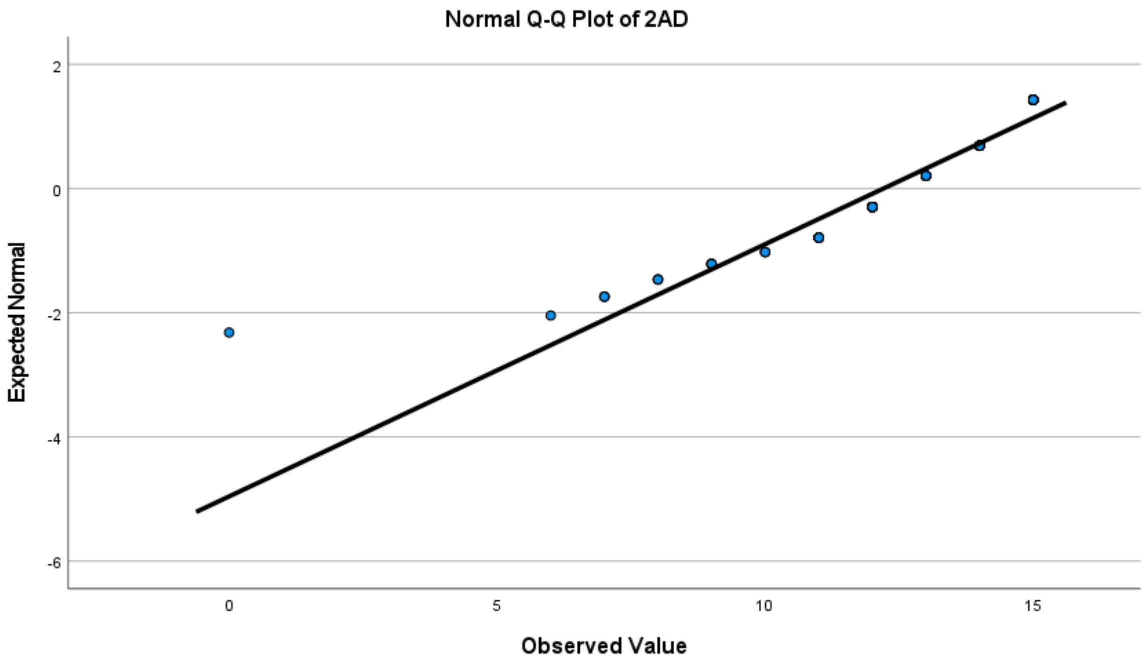

Figure 42. *Attention to Detail Retest Q-Q Plot*

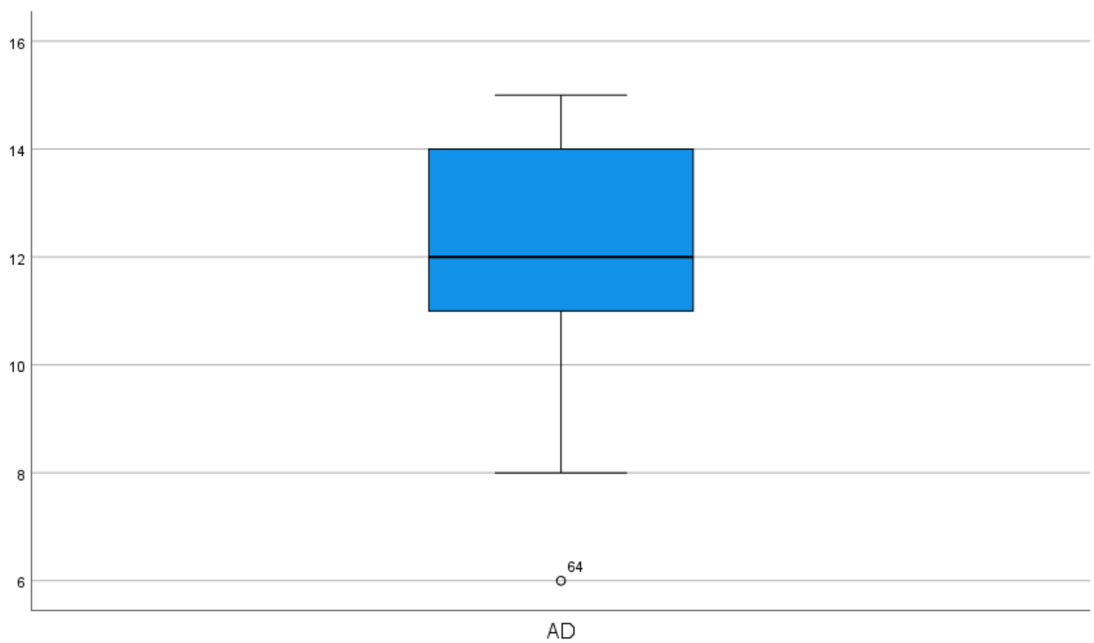

Figure 43. *Attention to Detail Boxplot*

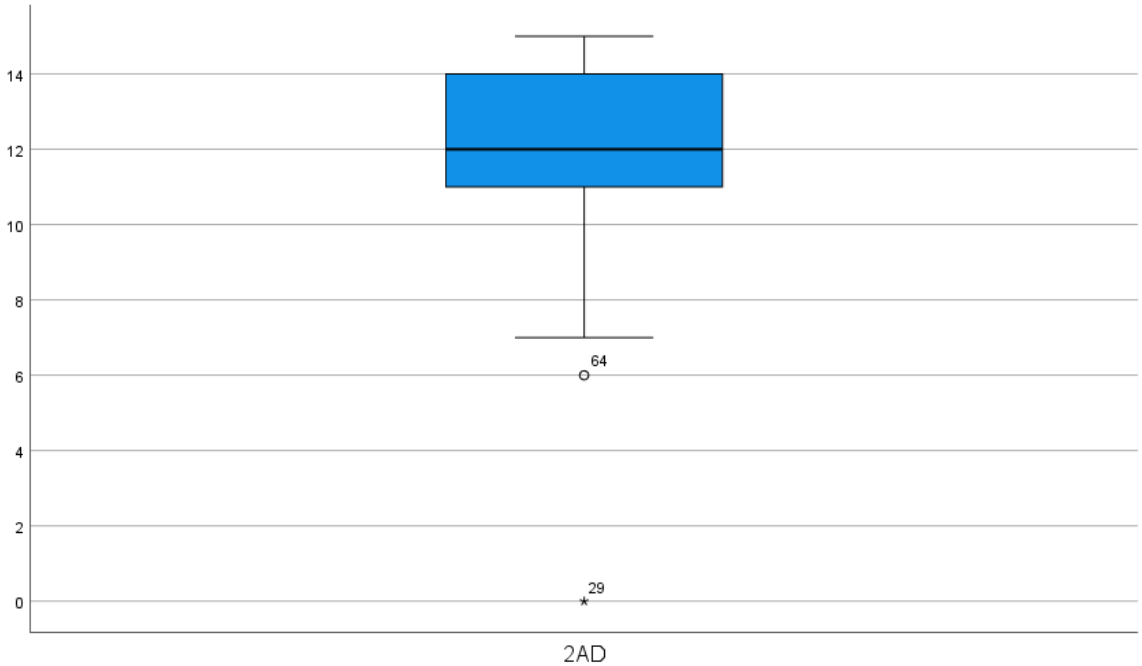

Figure 44. *Attention to Detail Retest Boxplot*

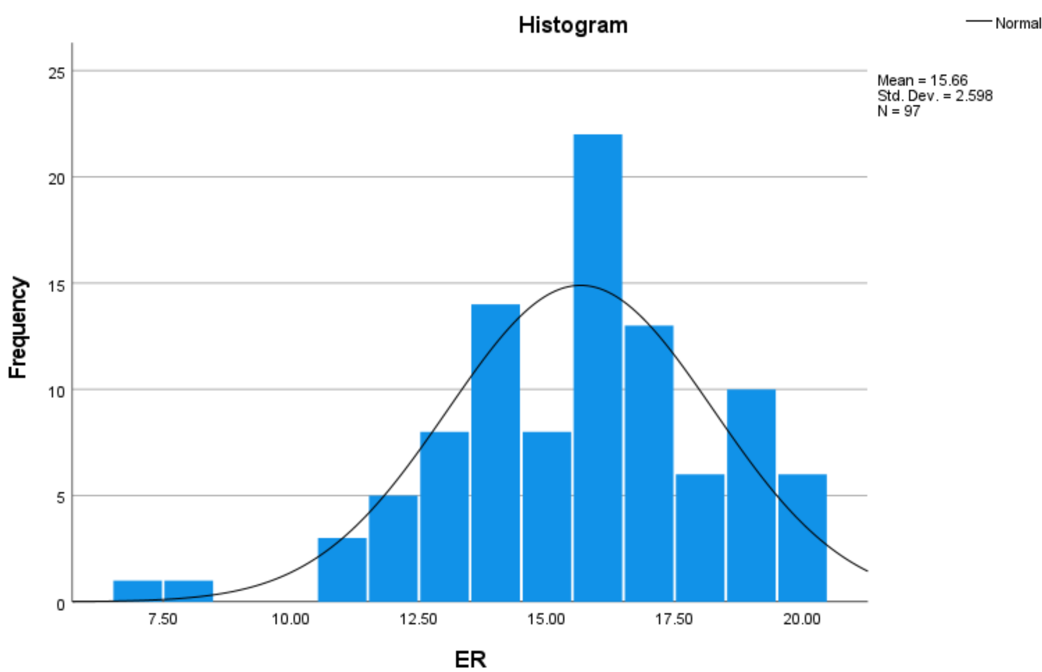

Figure 45. *Emotional Response Histogram*

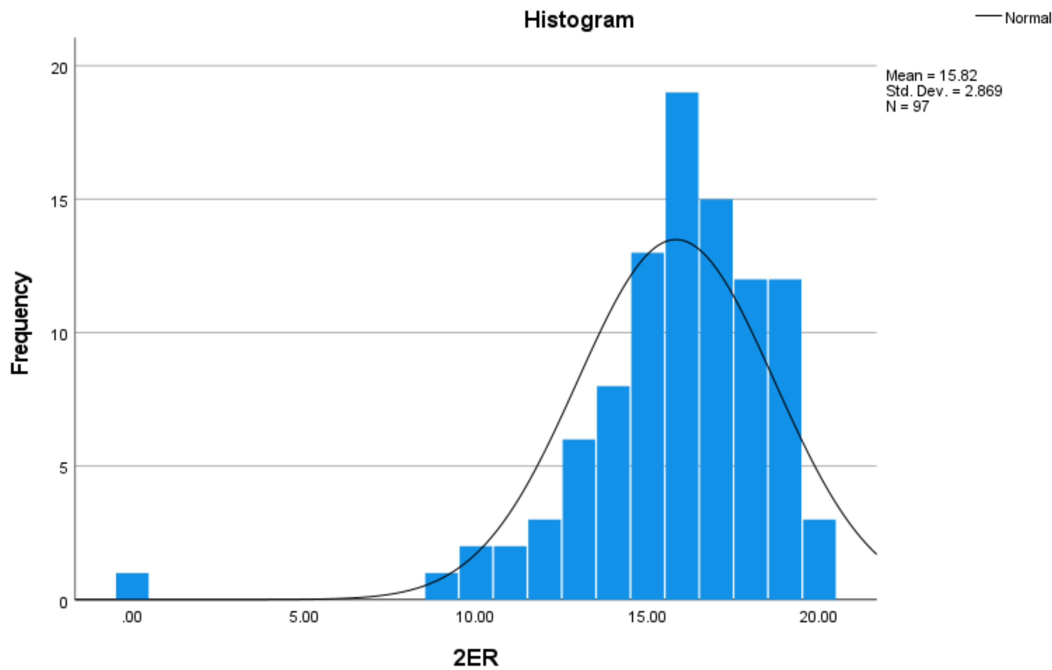

Figure 46. *Emotional Response Retest Histogram*

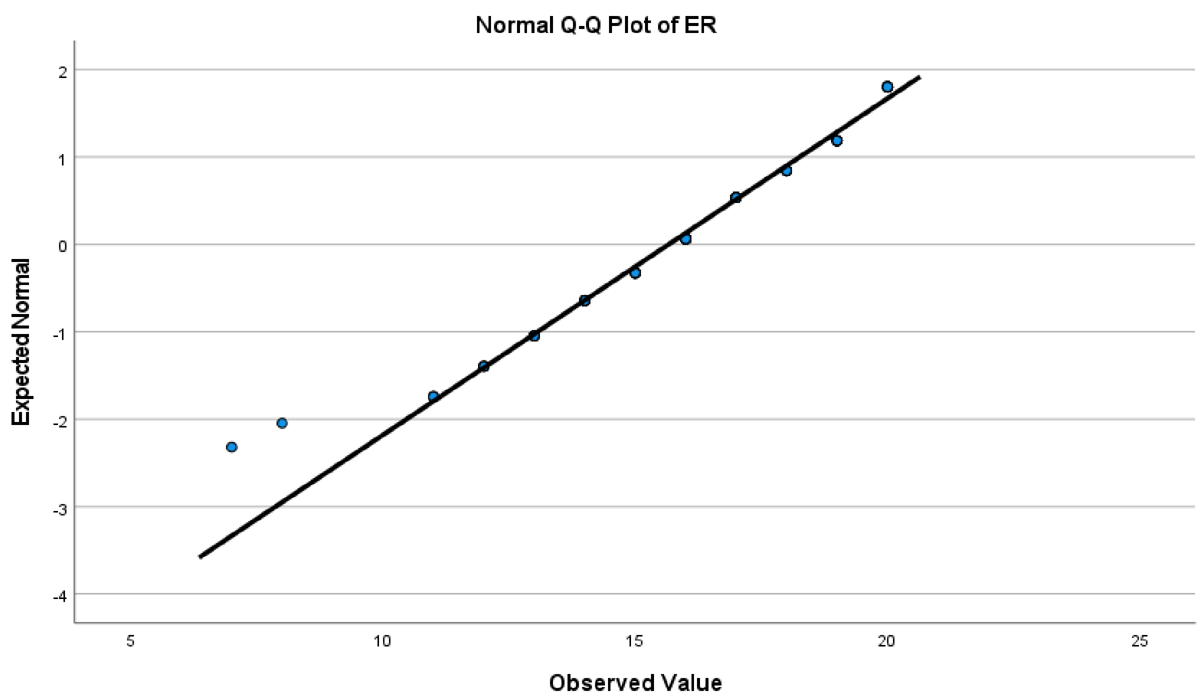

Figure 47. *Emotional Response Q-Q Plot*

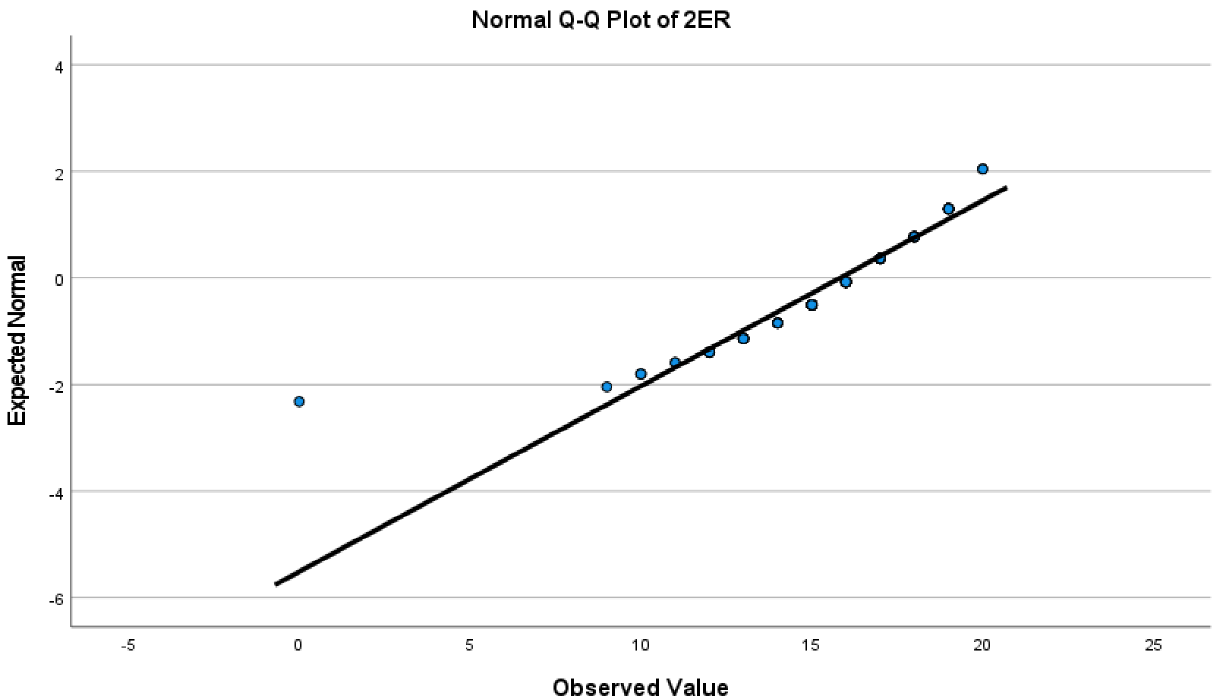

Figure 48. *Emotional Response Q-Q Plot*

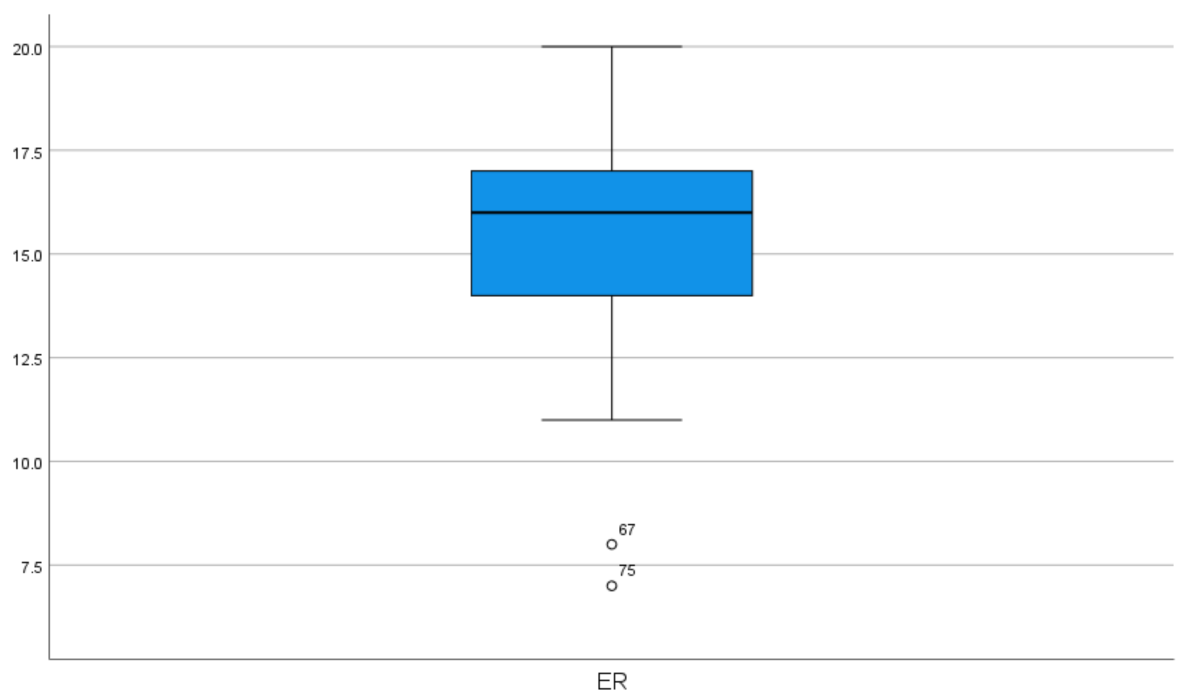

Figure 49. *Emotional Response Boxplot*

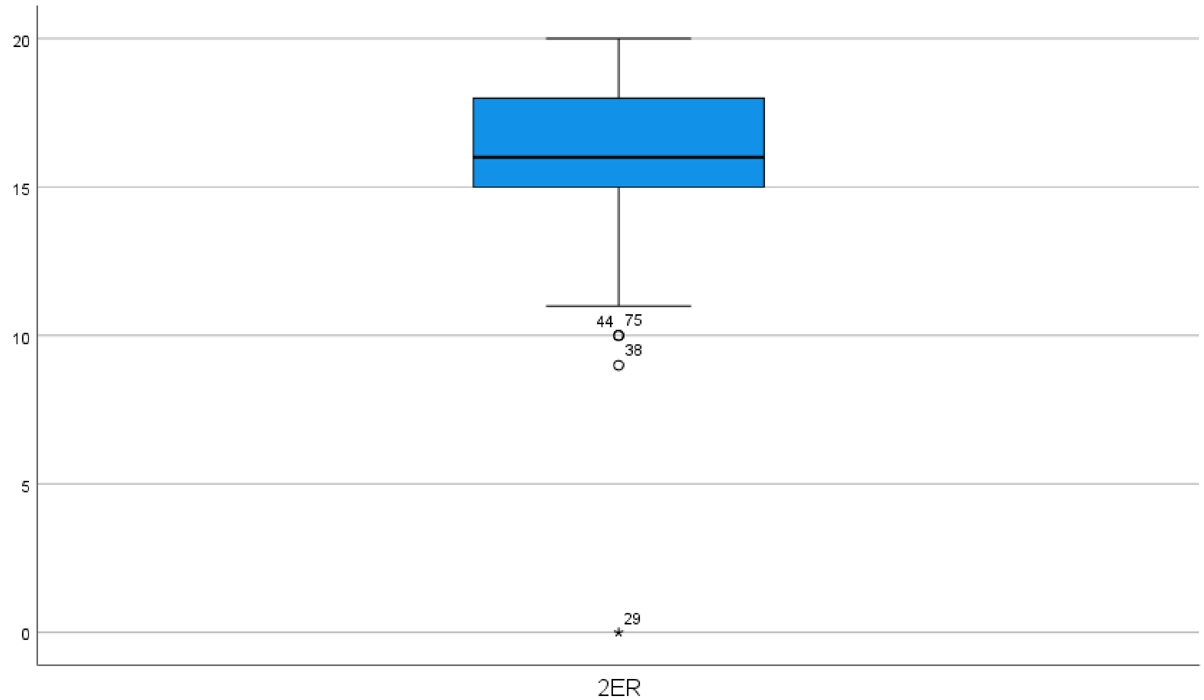

Figure 50. *Emotional Response Retest Boxplot*

After review of the boxplots, the researcher removed three more extreme cases identified by an asterisk (see Figures 38, 50, 56). To assess the impact the outliers had on normality, the researcher repeated the Kolmogorov-Smirnov and Shapiro-Wilk tests of normality and found that the model did not increase in statistical significance. Therefore, the researcher chose to maintain the 97 cases to conduct Pearson product-moment correlation for the test-retest.

To further assess normality, the researcher found that all skewness and kurtosis fell within the cutoff range of ±2 and ±7, respectively. Furthermore, the researchers examined a normal bell curve on the histograms for total and most subscales for the HSPS. Specifically, skewness and/or kurtosis impacted the *Empathy* (see Figure 27-28) and *Attention to Detail* (see Figures 39-40) bell curves yet meeting the requirements of overall values of skewness and kurtosis (e.g., within the cutoff range of ±2 and ±7; Hahs-Vaughn, 2017; Pallant, 2020).

Next, the researcher used scatterplots to assess both linearity and homoscedasticity, wherein all three scales met these assumptions. Due to normal distribution of data, the researcher chose to use the parametric measure, Pearson product-moment correlation, to assess correlations between scales and subscales across time (Kline, 2016).

Pearson Product-Moment Correlation. To determine error through the test reliability coefficient of stability, the researcher considered correlations at or above .50 as a moderate effect and those between .80 and .90 to be a strong effect (Ferguson, 2016). Based on the parameters, the overall test-retest correlation for the Total Score (r = .78) was acceptable and approaching a strong effect size. Furthermore, the test-retest reliability for the subscales ranged from r = .590 to .837 wherein all subscales showed to have at least a moderate reliability across time (see Table 19).

Table 18.

Pearson Product-Moment Correlation for Test-Retest

Scale or Item	Person Correlation (*r*)
Total Score	**.780****
Empathy	**.590****
Item 7- If my child knows I am having a hard time, my child tries to comfort me.	.541**
Item 8 - My child notices when I am having a hard day.	.567**
Item 5 - My child notices when their friend is upset.	.458**
Item 68 - My child notices when I am emotional.	.576**
Item 6 - My child feels sad when seeing someone else who is sad.	.470**
Response to Stimuli	**.837****
Item 72 - Loud noises startle my child.	.723**
Item 73 - Loud places do not overwhelm my child.	.558**
Item 77 - My child startles easily.	.763**
Attention to Detail	**.758****
Item 22 - My child notices when small things have change.	.458**
Item 21- My child remembers small details.	.645**
Item 43 - My child notices detail others might miss.	.696**
Emotional Response	**.762****

Scale or Item	Person Correlation (r)
Item 47- My child becomes upset when they don't feel understood.	.472**
Item 52 - When something doesn't come easily to my child, they can become upset.	.529**
Item 59 - My child becomes emotionally upset when hungry.	.803**
Item 71- My child becomes upset when someone raises their voice.	.587**

Note. **Correlation is significant at the 0.01 level (2-tailed).

Chapter Four Summary

In chapter four, the researcher presented the results of the data analysis. Initially, the researcher presented descriptive statistics, including response rates and participant demographics. Next, the researcher reported data screening and cleaning procedures. Prior to each analysis, the researcher presented assumptions and any preliminary analyses prior to running each analysis. Next, the researcher presented the first and primary research question, concerning the exploratory factor analysis (EFA) followed by the analysis of the internal consistency reliability of the finalized model. The researcher then conducted three additional exploratory analyses related to the EFA. The first was the use of Spearman rho correlations to establish convergent and discriminant validity. Next, the researcher used a MANOVA and a post hoc ANOVA to consider the relationship between demographic data and subscales scores of the HSPS. Finally, the researcher used a Pearson product-moment correlation to determine error through the test reliability coefficient of stability. In Chapter Five, the researcher will consider the findings from Chapter Four including both limitations of the study and implications considered for future research.

CHAPTER FIVE: DISCUSSION

In Chapter Five, the researcher provides a discussion of the findings. Specifically, the researcher presents the findings within the context of established literature. The researcher also presents the strengths and limitations of the study and analyses. The researcher then derives implications from the findings for counselors and caregivers supporting children with SPS. Finally, the researcher concludes with recommendations for future research in identifying SPS in preschool age children.

Discussion of the Findings

Below the researcher includes results of the analyses of each research question within the context of established literature. Additionally, the researcher notes both strengths and limitations of the study design and analyses.

Research Question 1

The researcher ran an exploratory factor analysis (EFA) to determine the factor structure of the items on the HSPS with a sample of primary caregivers of children 3-5 years old. Specifically, the researcher identified a four-factor, 15-item model that explained 41.45% of the variance (See Table 21). The researcher labeled each factor as follows: (a) Factor 1 *Empathy* (n = 5), accounting for 17.92% of variance explained, (b) Factor 2 *Response to Stimuli* (n = 3) 11.85%, (c) Factor 3 *Attention to Detail* (n =3), 6.6%, and (d) Factor 4 *Emotional Responses* (n = 4) 5.1% (see Table 20). The HSPS is the first measure to identify SPS in preschool age children and is also the only caregiver-report measure developed to identify SPS in children. The development of the HSPS addresses the gap in support to identify SPS in a population (i.e., children ages 3-5 years-old) that researchers have identified to be at the highest risk for both presence of chronicity of mental health challenges in adulthood (Pluess et al., 2018; Rapee et al., 2005).

Table 19.

Pattern Matrix for the Final Four-Factor Model

HSPS Item	Factor 1	Factor 2	Factor 3	Factor 4
7-If my child knows I am having a hard time, my child tries to comfort me.	.754	--	--	--
8-My child notices when I am having a hard day.	.733	--	--	--
5- My child notices when their friend is upset.	.544	--	--	--
68- My child notices when I am emotional.	.526	--	--	--
6- My child feels sad when seeing someone else who is sad.	.458	--	--	--
72- Loud noises startle my child.	--	.748	--	--
73- Loud places do not overwhelm my child.	--	.666	--	--
77- My child startles easily.	--	.605	--	--
22- My child notices when small things have change (e.g., person's appearance, item has been moved).	--	--	.770	--
21- My child remembers small details.	--	--	.652	--
43- My child notices detail others might miss.	--	--	.609	--
47- My child becomes upset when they don't feel understood.	--	--	--	.667
52- When something doesn't come easily to my child, they can become upset.	--	--	--	.642
59- My child becomes emotionally upset when hungry.	--	--	--	.521
71- My child becomes upset when someone raises their voice.	--	--	--	.312*

Note. * Denotes a weak correlation value. -- Denotes correlations suppressed at 0.30. Factor 1 interpreted as *Empathy*; Factor 2 interpreted as *Response to Stimuli*; Factor 3 interpreted as *Attention to Detail*, Factor 4 interpreted as *Emotional Response*.

Similarities Across Measures of Sensitivity. While the HSPS is the first instrument developed specifically for identifying SPS in preschool-age children, the researcher identified similar factors between the HSPS and other previously developed measures of sensitivity created for older children and adults. Considering the assumption that SPS is an ever-present, innate trait impacted by nurturance (Aron, 2015), the researcher assumed that findings from measures of other age groups were comparable.

The first similarity across measures was the presence of the factors measuring emotionality (e.g., *Negative Emotionality*, Smolewska et al., 2006; Sobocko & Zelenski, 2015; *Emotional Responses*, HSPS). The second similarity was the presence of overstimulation due to environmental stimuli (e.g., *Low Sensitivity Threshold,* Smolewska et al., 2006; Sobocko & Zelenski, 2015; *Response to Stimuli,* HSPS). The presence of overstimulation and emotionality across measures for adults and young children supports the assumption that SPS is an innate trait and not an acquired trait or developed dysfunction. Considering SPS as an innate trait heightens the importance of identifying the trait early in life (e.g., preschool age). Considering the limitations found in the results, clinicians can use the HSPS as a guide to first identify traits of SPS and then provide psychoeducation for caregivers. Through education, clinicians would then equip caregivers with understanding, empowering each caregiver to respond to the child in a supportive manner. For example, caregivers who understand that their child has stronger neurological and emotional responses to stimuli (Pluess et al., 2018) may learn through conversations with the counselor that their child may need more time and patience to process all experiences.

Differences Across Measures of Sensitivity. The researcher did not find a factor on the final model of the HSPS that was comparable to the *Aesthetic* factor in other sensitivity scales (e.g., Smolewska et al., 2006; Sobocko & Zelenski, 2015). However, the HSPS five-factor model originally had a similar subscale, *Noticing and Appreciating Others and Surroundings,* which the researcher deleted due to its high correlation with recruitment type (F (1,558) = 4717.514, $p <$ .0001, $\eta 2 = .891$). Other cross-cultural studies on SPS also lack the aesthetic factor (e.g., Ershova et al., 2018; Montoya-Pérez, 2019) further supporting the absence of aesthetic sensitivity when identifying SPS within non-White populations (more details can be found under *Multicultural Considerations*).

Regarding Factor 1 *Empathy*, no other model of high sensitivity had a factor that included items related to empathy, creating a new area of understanding regarding SPS in young children (Aron & Aron, 1997; Evans & Rothbart, 2008; Montoya-Pérez et al., 2019; Smith et al., 2019; Smolewska et al., 2006; Sobocko & Zelenski, 2015). While items pertaining to empathy are not included in other developed instruments on sensitivity, empathy is found in the theoretical tenants of SPS (Aron, 2015; Pluess et al., 2018). Furthermore, empathy is a behavior that, within the general population of preschool age children, only begins to develop at age five as egocentrism lessens and children begin to consider others' perspectives (Dillman Taylor, 2016; Erikson, 1963). Based on the mean age of the sample (3.8 years old), the results from the study challenge established knowledge concerning of the development of empathy in young children. Furthermore, the researcher concluded that the development of empathy may begin earlier than previously thought. Finally, considering how SPS impacts the development of empathy in preschool age children, the results from the HSPS show increased empathy in children with SPS indicating that HSPS is measuring a phenomenon unique to the general population. This result underscores the importance of returning to the theoretical underpinnings of a phenomenon when developing a measure using an EFA (DeVellis, 2017; Dimitrov, 2012).

Within the EFA, the researcher calculated the inter-factor correlations. Significant or strong inter-factor correlations (i.e., 0.2 to 0.4) support the presence of related factors measuring a single phenomenon (Piedmont & Hyland, 1993). Furthermore, the correlations underlying the model show support for the factorability of the items; an assumption also supported by the final KMO score of .760 (middling; Kaiser & Rice, 1974). For values of inter-factor correlations, the researcher considered whether the intercorrelations were high (.70), moderate (.45), or low (.20; Clark & Bowles, 2018; Mvududu & Sink, 2013). The researcher found near moderate and moderate correlations between Factors 1 (Empathy) and 3 (Attention to Detail; r = .346; 12.1% of the variance explained) as well as 2 (Response to Stimuli) and 4 (Emotional Response; r = .483, 23.3% of the variance explained).

While not the primary focus of the study, a pattern emerged in which caregivers would strongly indicate in their children either positive behaviors (Factors 1 and 3) or challenging behaviors (Factors 2 and 4), but rarely both at the same time. The identified pattern was consistent throughout all conducted EFAs. The researcher hypothesized that those who had identified strong scores for items on Factors 1 and 3 had an increased understanding in their child's emotional needs and therefore increased the comfort level for their child, who was able to respond with positive behavior. Within the context of the established literature, the researcher considered how the quality of the caregiver-child relationship might provide insight into the identified dichotomous relationship of caregivers generally observing only positive or negative behaviors in their preschool age children (Nixon et al., 2004). Researchers explained that children with the SPS trait tend to respond to their environment differently based on their perceptions of their environments (i.e., differential susceptibility; Bakermans-Kranenburg & van IJzendoorn, 2011; Caspi et al, 2002, 2003; Kochanska et al., 2011). For instance, children with

SPS who perceive their environment as nurturing respond to their environments with more positive behaviors than the general public; whereas children who lack support within their environments are more likely to respond to their environment with more challenging behaviors than the general population (i.e., increased emotional upset; Aron et al., 2005; Belsky et al., 2009; Pluess & Belsky, 2013). Additionally, Barnette and Scaramella (2015) found when a caregiver was responsive, a child with sensitivity thrived, exhibiting fewer challenging behaviors. Conversely, when the child was met with an absence of support, their sensitivity to their environment was heightened, resulting in an increase in challenging behaviors. Therefore, future researchers should consider how caregiver's supportiveness impacts their perception and reporting of SPS.

Conversely, the researcher found weak to negligible correlations between Factors 1 and 4 (r = .206, 4.2% of the variance explained), Factors 2 and 1 (r = .101, 1% of the variance explained), and Factors 2 and 3 (r = .152, 2.3% of the variance explained). The small correlations between these factors seem to show that on rare occasions caregivers, who observed their child's increased ability to express emotions (e.g., Emotional Responses), also observed an increased ability to recognize and share in others' emotions (e.g., Empathy). Finally, the researcher hypothesized, that teaching a caregiver to encourage a child's strengths while being mindful of the things that overwhelm the child, could be the optimal method of support for preschool age children with SPS. Moreover, the small interfactor correlations, between positive and challenging behaviors, indicate that this level of balance is difficult to achieve and could be an assessment goal based on an intervention study targeted on psychoeducation for caregivers of preschool age children with SPS.

Research Question 2

The researcher used SPSS (version 27.0) to conduct Cronbach's Alpha to assess for internal consistency. Considering the internal consistency of items on the HSPS, the researcher attained an acceptable level (α = .744) for the HSPS total score, close to the optimal score between of .80 and .90 (Hahs-Vaughn, 2017). Most factors also showed an acceptable level of internal reliability (Factor 1, α = .759; Factor 2, α = .723, Factor 3, α = .716); however, the researcher found a less than desirable internal reliability for Factor 4 (α = .658) (DeVellis, 2013). The lower value of Factor 4 indicated that items were heterogeneous (Kline, 2016). Based on the potential concern, the researcher attempted to delete items from Factor 4, one at a time, and no other combination of items produced a higher Cronbach's Alpha value. Based on the lack of model improvement, the researcher kept all items in Factor 4, Emotional Response.

Looking more closely at each item on Factor 4 (i.e., item 47, 52, 59, and 71) within the context of established literature, the researcher concluded all items pertained to emotionality, yet the emotionality came from different areas of sensitivity defined by Aron's (2015) D.O.E.S acronym (Depth of Processing, Overstimulation, Empathy and Emotionality, and Sensitive to Subtle Stimuli). Specifically, the researcher found items within the general category of SPS, Depth of Processing (i.e., 47 and 71; Aron, 2015; Acevedo et al., 2014), Empathy and Emotionality (i.e., item 52; Aron, 2015), and Sensitive to Subtle Stimuli (i.e., item 59; Aron, 2015; Aron, 2020; Smolewska, McCabe, & Woody, 2006; Sobocko & Zelenski, 2015). Further investigation is warranted to better understand whether a single factor is represented across the four items, or three different factors are being represented by the four items.

Research Question 3

The researcher hypothesized the HSPS total score would have a moderate to strong correlation with (a) ATEC subscale, Sensory/Cognitive Awareness and (b) PAS subscales, Generalized Anxiety and Social Anxiety. To assess the hypotheses, the researcher used Spearman rho correlations to analyze the relationship between HSPS total and subscale scores with both PAS and ATEC total and subscale scores, based on the results shown in Table 22 and the researcher's hypotheses for discriminant and convergent validity.

PAS. Considering convergent validity, the researcher found a minimal practical significance and strong statistical significance between the HSPS total scores with the PAS total score (rho = .237, p < .01). The convergent validity, found in the small practical significance between the HSPS and the PAS, indicates while some overlapping behaviors exist, the practical significance remains small. The results further support previous research, finding measures of anxiety have a small, positive correlation with measures of SPS (Aaron, 2015; Liss et al., 2008; Ryan & Ollendick, 2018). Furthermore, results confirmed the researcher's hypothesis, that an overlap across behaviors of anxiety and SPS exist in preschool age children (Aron, 2015), as previous studies have demonstrated with adults (Bakker & Moulding, 2012; Liss et al., 2008). With the overlap of shared symptomology, clinicians can use the HSPS to assist in differentiating between common childhood diagnoses and SPS (Aron, 2015; Sangster et al., 2014). When SPS is identified, the clinician can then provide the family and child with education about behaviors related to the trait and how to best nurture and support the child through difficult times. By referring to items in the HSPS, clinicians can minimize the risk of a misdiagnosis by discerning if behaviors are an innate part of the child or the development of an anxiety disorder.

When looking at the association between HSPS with the Generalized Anxiety Subscale, the researcher found a smaller than expected correlation (*rho* = .256), yet she found a stronger positive correlation between the Response to Stimuli subscale and Generalized Anxiety subscale (*rho* = .340). The theoretical underpinning of SPS and previous research (e.g., Aron, 2015, Liss et al., 2008) support this finding. Specifically, items on the subscale *Response to Stimuli* assess aspects of being overwhelmed by external stimuli, a feature also present for individuals with *Generalized Anxiety*. However, HSPS total score includes *Depth of Processing, Empathy*, and other characteristics that are not behaviors related to Generalized Anxiety Disorder (GAD). Liss and colleagues (2008) found that sensitivity to subtle stimuli, without the ability to identify one's own feelings leads to anxiety. These findings support the fact that the appearance of heighten emotion alone is not enough to identify an anxiety disorder without considering that response to stimuli could be a result of SPS.

Additionally, based on these findings, the items on the HSPS can help to differentiate between SPS and GAD. In cases where children exhibit a behavior that could be indicative of several different conditions, caregivers, counselors, and physicians are highly encouraged to recognize the need to differentiate between common childhood mental diagnoses and temperament traits. Similar to Liss and colleagues' (2008) findings, the results of the HSPS indicate a need for future researchers to assess emotional intelligence within the development of anxiety in children with SPS.

As the researcher expected, a significant correlation was found between HSPS and the PAS subscale social anxiety, but not a substantial effect size (*rho* = .127, $p < .01$). The results further underscore the importance of differentiating between experienced danger and a sense of fear. For example, a child with either SPS or social anxiety may become overwhelmed in social settings, but a child with SPS does not experience fear, an emotion present with a child experiencing social anxiety (Aron, 2015). Using the HSPS may allow clinicians, caregivers, and physicians to make the distinction between social anxiety and SPS, thereby normalizing the behavior of the child with SPS. Without normalizing the behavior, the child experiences rejection and shame, becoming stuck and at increased risk for developing anxiety or depression (Aron, 2015; Liss et al., 2008).

While the researcher did not predict the correlation between *Response to Stimuli* and *Physical Injury Fears* subscales, she found the strongest correlation between these two subscales (*rho* = .432). When looking at the *Physical Injury Fears* subscale, within the modified PAS model, three items remained (i.e., scared of heights, afraid of crowded or closed-in spaces, and scared of thunderstorms). All three were environmental elements that could cause overstimulation for a child with SPS. Similarly, *Response to Stimuli* also refers to aspects of the environment that cause overstimulation. Clinicians may consider administering both the HSPS and PAS to consider differential symptomology outside of overstimulation.

While previous researchers have not considered emotional responses or response to stimuli to understand similarities between SPS and anxiety, the outcomes of the current study demonstrated both convergent (small to moderate correlations) and divergent (non-significant correlations) between SPS and anxiety. The researcher observed that while HSPS identified some behaviors with the PAS (i.e., convergent validity), the HSPS and PAS appear to measure distinct phenomenon (i.e., discriminant validity). For example, the HSPS subscale *Attention to Detail* did not correlate at all with the PAS total or subsequent subscales.

ATEC. While considering discriminant validity and challenging previous research findings, the researcher found a non-statistically significant negative correlation between the

HSPS and ATEC total scores (*rho* = -. 008, p > .01; Aaron, 2015; Liss et al., 2008; Ryan & Ollendick, 2018). While the Spearman rho correlations failed to demonstrate convergent validity at the total score level, the researcher found additional support for statistically significant correlations between the HSPS and ATEC at the subscale level. Finally, the researcher's analysis indicates that while the phenomena (i.e., SPS and autism) are distinct in nature, some shared behaviors exist between the two phenomena as evidenced by the correlations across subscales.

Supporting convergent validity, the researcher identified a small, positive correlation between the HSPS subscale *Response to Stimuli* and ATEC subscale *Sensory/Cognitive Awareness* (*rho* = .236). While other researchers have yet to consider this relationship, the researcher hypothesized that children, who were experiencing overstimulation, may exhibit behaviors that look similar to autistic behaviors of being disengaged and unaware of one's environment as described by items within *Sensory/Cognitive Awareness*. Furthermore, researchers have determined that while some overlap does exist in observed or reported behaviors, mental health instruments do not assess nor differentiate from sensory processing sensitivity (Liss et al., 2008; Meyer et al., 2005; Smolewska et al., 2006). The use of the HSPS is a potential tool that can provide clinicians with the tools to differentiate SPS from the mental health diagnosis of autism.

Finally, the researcher identified additional discriminant validity, a small, negative correlation between the HSPS subscale *Empathy* and the ATEC subscale *Sensory/Cognitive Awareness* (*rho* = -.233). Previous researchers have not studied *Empathy* as part of assessments of SPS, but Aron (2015) has theorized the presence of empathetic behavior in individuals with SPS. The negative correlation suggests that a single behavior, engagement/awareness, is being measured. However, scores indicate a continuum of these behaviors, with children whose parents reported high scores for engagement and hyper-awareness of their surroundings also reported low scores on the absence of Sensory/Cognitive Awareness; whereas children who may have autism score the opposite of these scales. Referencing the opposing sides represented by the two subscales, clinicians can utilize the HSPS to better differentiate behaviors. For example, if a child connects well with others and shows empathy yet still experiences overstimulation, the clinician can then reference the HSPS and conclude that more than likely the child has the innate temperament trait SPS and not autism.

Table 20.

Spearman rho Correlations Between HSPS and both PAS and ATEC

	HSPS Total Score	Empathy	Response to Stimuli	Attention to Detail	Emotional Responses
PAS Total	.237**	- *	.400**	--	.279**
Generalized Anxiety	.256**	--	.340**	--	.320**
Social Anxiety	- **	- **	.269**	--	- **
Obsessive Compulsive.	--	- **	.252**	--	- **
Physical Injury Fears	.230**	- *	.432**	--	.240**
Separation Anxiety	- **	--	.252**	--	- **
ATEC Total	--	-.253**	.232**	- *	- **
Speech/Language and Communication	- **	-.205**	- *	-.200**	--
Sociability	--	-.200**	- **	--	- **

	HSPS Total Score	Empathy	Response to Stimuli	Attention to Detail	Emotional Responses
Sensory/Cognitive Awareness	--	-.233**	.236**	- **	- *
Health/Physical/Behavior	- **	- **	- **	--	- **

Note. ** Correlation is significant at the 0.01 level (2-tailed); * Correlation is significant at the 0.05 level (2-tailed); – Denotes minimal effect size; -- Denotes statistical non-significance.

Research Question 4

For research question four, the researcher used a MANOVA for differential item functioning. Specifically, the researcher looked at the relationship between HSPS total and subscale scores with reported demographic data. The researcher identified significant group differences for both HSPS subscale and total scores when considering caregiver ethnicity, race, gender, and education. In the current study, the researcher uncovered statistical significance in the results across demographic variables. Previous researchers could not measure these variables because of the homogeneity of the population sample (e.g., age, Montoya- Pérez, 2019; Pluess et al., 2018; education, Lionetti et al., 2018; Sobocko & Zelenski, 2015; Ershova et al., 2018; race, Pluess et al., 2018; marital status, Montoya- Pérez et al., 2019; socioeconomic status, Montoya-Pérez et al., 2019), which left a skewed picture of SPS that researchers could not generalize to the larger population. The same responses across different cultures may have different meanings. If researchers do not use a sample that spans different cultures, they may not know if their findings are the result of cultural influences or a trait of children with SPS in general. Overall, researchers conducting studies on SPS have not considered group differences across caregiver demographics (Evans and Rothbart, 2008; Lionetti et al., 2018; Liss et al., 2008; Sobocko & Zelenski, 2015). Even when considering research on SPS in other languages and countries, generalizability of findings was limited to homogeneity of the study (e.g., Montoya- Pérez et al., 2019). Despite noted limitations, Montoya-Pérez and colleagues (2019) were able to establish a two-factor model and concluded that SPS may manifest differently in individuals across varying cultures, resulting in a diverse number of models to identify the sensitivity temperament trait. Additionally, Ershova and colleagues (2018) hypothesized a gender group difference across undergraduate college students in Russia on reported sensitivity experiences yet did not follow through to check for group differences. Finally, the researcher considered significance of effect size for group differences, using Hahs-Vaughn (2017) recommendations wherein a partial eta squared ($\eta 2$) is considered small at 0.01, medium at 0.06, and large at 0.14.

Caregiver Race. The researcher looked to see if a statistical difference existed between race of caregiver (Caucasian, *n* = 414; Black or African American, *n* = 37; Asian, *n* = 48; American Indian or Alaska Native, *n* = 19; Native Hawaiian or Pacific Islander, *n* = 2; Bi-racial/ Multiracial, *n* = 21; or Other, *n* = 15) and subscale scores. The researcher identified a statistically significant group difference based on the participants' race ($F = 1.72$, $p < .05$, Wilk's $\lambda = .928$, partial $\eta 2 = .019$). Specifically, the researcher found a statistically significant group difference for *Emotional Response* with a small effect size ($F = 2.663$, $p < .05$, $\eta 2 = .028$). Specifically, Black or African American participants scored lower on *Emotional Response* (*M* = 12.73, *SD* = 3.05) compared to all other races represented in the study, the highest being Caucasian (*M* = 14.57, *SD* = 2.68). Being the first study to consider the race of caregiver and its potential impact on subscale scores, the researcher could not compare these results to other studies. However, it is important to note that differences, albeit small, manifested between races, indicating the need to replicate this study to determine if SPS expresses differently across cultures. In the future, researchers should consider equitable cutoff scores that accurately represent individuals across races. Overall, the identified group differences highlight the importance of judging *normal* behaviors according to the context of the client's own culture rather than a global assessment. Finally, the subsamples across race, except Caucasian, Black or African American, and Asian, were too small to fully understand how intersecting identities may affect response.

Caregiver Gender. The researcher looked to see if a statistical difference existed between caregiver gender (Female, n = 440; and Male, n = 116) and subscale scores. The researcher identified a statistically significant group difference based on the participants' gender ($F = 3.799$, $p < .05$, Wilk's $\lambda = .973$, partial $\eta2 = .027$). Specifically, the researcher found a significant group difference across caregiver gender for *Empathy* ($F = 5.977$, $p < .05$, $\eta2 = .011$). Female participants scored higher on *Empathy* ($M = 20.63$, $SD = 3.13$) compared to Male participants ($M = 19.86$, $SD = 2.41$). Additionally, the researcher found a statistically significant group difference across caregiver gender for *Response to Stimuli* with a very small effect size ($F = 4.232$, $p < .05$, $\eta2 = .008$). Female participants scored lower on *Response to Stimuli* ($M = 8.55$, $SD = 2.58$) compared to Male participants ($M = 9.09$, $SD = 2.02$).

While researchers in previous studies (e.g., Landreth & Lobaugh, 1998; Opiola & Bratton, 2018; Pluess et al., 2018) considered group differences across the child's gender related to parenting behaviors and the child's externalized behaviors, they did not consider group differences based on caregiver gender. Without knowing how caregiver gender impacts the way caregivers report SPS behaviors, clinicians may struggle with the best way to address and support caregivers based on their unique needs. Although the differences were small, it is important for clinicians to consider caregivers' report within the context of gender. For example, if male caregivers are more likely to report higher levels of *Response to Stimuli*, the clinician administering the HSPS may consider this tendency when interpreting HSPS responses by male caregivers. In the current study, no participants identified as transgender or non-binary leaving room to further explore the impact of gender identity on caregivers' reported behaviors of their preschool age children related to SPS.

Caregiver Education. The researcher looked to see if a statistical difference existed between caregiver education and subscale scores. The researcher identified a statistically significant group difference based on the participants' education ($F = 2.092$, $p < .05$, Wilk's $\lambda = .913$, partial $\eta2 = .022$). Specifically, the researcher found a statistically significant group difference across caregiver education for *Emotional Response* with a small effect size ($F =3.650$, $p < .05$, $\eta2 = .038$) with 3.8 % of the variance explained, a small effect size, as is evident by caregivers with no degree or diploma scoring higher than any other educational group on *Emotional Response* (*M* = 15.5, *SD* = 2.67) compared to the lowest scoring educational group, Associate Degree (*M* = 13.55, *SD* = 2.82; see Figure 26). Finally, the group difference found across caregiver education for *Response to Stimuli* was statistically significant with a small effect size ($F =3.048$, $p < .05$, $\eta2 = .032$), as is evident by caregivers with a Vocational/Technical Certification scoring lower than any other educational group on *Response to Stimuli* (*M* = 7,56, *SD* = 2.10) compared to the highest scoring educational group, Masters Degree / Advanced Degree (*M* = 9.13, *SD* = 2.48). Even with a fairly small sample size, the researcher found a near medium effect size for caregiver education ($\eta2 = .038$ and $.032$); therefore, further investigation is warranted to investigate this potential influence of educational levels on *Emotional Response* with a larger sample size. Additionally, the subsamples Vocational/Technical Certification and No Degree or Diploma were too small to fully understand how intersecting identities may affect response.

Finally, the near medium effect size not only indicates a statistically significant difference but more importantly a greater ability to apply the impact to the general public. While the causality of the relationship between education level and reported behaviors related to *Emotional Response* and *Response to Stimuli* is undefined, both subscales report challenging behaviors expressed by children with SPS. Additionally, Assari (2018) found that an increase in caregiver education was positively correlated with the family's ability to overcome poverty, yet less likely for Black families than White families. These findings call for further investigation, using Latent Class Analysis (LCA), regarding the intersectionality of variables (e.g., race and income) impacting the relationship between education and the two subscales. Considering the higher risk for families to remain in poverty, the researcher concluded that children from families with lower levels of education, who have SPS, may be at a higher risk for long-term emotional distress (e.g., anxiety and depression; Aron et al., 2005; Belsky et al., 2009; Ellis et al., 2011; Kibe et al., 2020; Pluess & Belsky, 2013).

Child Demographics. Finally, the researcher identified an absence of group differences when considering the child's demographics. In this study, the absence of group differences underscores the developmentally responsiveness of created items (e.g., no group differences across children's ages). Moreover, the findings support the researcher's decision to develop items on a scale that were developmentally responsive to a particular age group (i.e., children 3-5 years-old) that is consistently used when looking at development (Dalimonte-Merckling & Brophy-Herb, 2019). Additionally, the absence of group differences highlights the presence of subjectivity in the caregiver report. Despite the potential for subjectivity in caregiver reports, researchers have found that caregivers' perceptions influence the quality of the caregiver-child relationship, functioning as truth for long-term mental health outcomes in their children

(Landreth & Bratton, 2006; Landreth & Lobaugh, 1998; Opiola & Bratton, 2018). When a caregiver understands their child's temperament—and therefore their behaviors—they can address and respond to vulnerabilities their child may face along a developmental trajectory (Checa & Abundis-Gutierrez, 2017; Dalimonte-Merckling & Brophy-Herb, 2019). This phenomenon highlights the importance of providing psychoeducation to caregivers on the presence of SPS, mitigating a child's decreased emotional well-being throughout their lifespan (Aron & Aron, 1997; Bright & Thompson, 2018; Rapee et al., 2005).

Using differential item functioning to determine group differences was something researchers had not previously done. The current outcomes support the idea that further research is needed to investigate the HSPS's ability to identify sensitivity in preschool age children across all demographics. The findings are also supported by the work of Montoya- Pérez and colleagues (2019), who found that *Aesthetic* items were not indicators of sensitivity across cultures. Moreover, the researchers suggested that diverse samples are needed to identify items/factors that explain the phenomenon of sensitivity through an inclusive global lens (Montoya- Pérez et al., 2019). Specifically, both a study in Russia and one in Mexico found that the *Aesthetic* items were not present when identifying sensitivity in undergraduate college students (Ershova et al., 2018; Montoya- Pérez et al., 2019), a finding also identified during the EFA for the HSPS. The similarities across studies further suggest that the HSPS included items/factors that are representative of a diverse population of caregivers with preschool age children.

Finally, the presence of group differences provided the researcher a foundation to hypothesize that differences in participants' responses from various demographic backgrounds could explain the challenges in the EFA (i.e., low interfactor correlations and lower-than-expected internal reliability). Additionally, the researcher hypothesized that she could identify additional variance explained through the inclusion of moderating demographic variables within the model using Structural Equation Modeling (SEM).

Research Question 5

To assess test-retest reliability, the researcher used Pearson product-moment correlation to assess correlations across time for the 15-item, four-factor HSPS model. To determine measurement error through the test reliability coefficient of stability, the researcher considered correlations at or above .50 as a moderate effect and those between .80 and .90 to be a strong effect (Ferguson, 2016). Based on the parameters, the researcher found a moderate effect for the overall test-retest correlation for the total score (r = .78). Furthermore, the test-retest reliability for the subscales ranged from r = .590 to .837, indicating that all subscales demonstrated at least a moderate reliability across time (see Table 23). Although varied, most effect sizes were comparable to the study conducted by Pluess and colleagues (2018) on identifying sensitivity in children 8-18 years old. Wherein the test-retest reliability, across a two-to-three-week period, for the total score was r = .68 and subscales ranged from r = .57 to .78. In comparison with previous research (e.g., Pluess et al., 2018), the researcher found even stronger test-retest reliability. Specifically, the test-retest reliability, across a two-to-three-week period was r = .78 for the total score (61% of the variance explained) and the subscales ranged from r = .590 to .837 (35-70% of the variance explained; see Table 21). With comparable time frames for the test-retest across the two studies, the researcher hypothesized that an increase in reliability was due to a focus on a single developmental stage in childhood in the HSPS (i.e., 3-5 years of age) compared to Highly Sensitivity Child Scale (HSCS; Pluess et al., 2018) wherein the researchers had to consider that multiple developmental stages meet varying developmental goals of children 8-19 years-old. The large age range considered, when creating items, may have created challenges for individuals to respond consistently with children representing varying developmental stages.

Table 21.

Pearson Product-Moment Correlation for Test-Retest

Scale or Item	Person Correlation (*r*)
Total Score	**.780****
Empathy	**.590****
Item 7- If my child knows I am having a hard time, my child tries to comfort me.	.541**
Item 8- My child notices when I am having a hard day.	.567**
Item 5- My child notices when their friend is upset.	.458**
Item 68- My child notices when I am emotional.	.576**
Item 6- My child feels sad when seeing someone else who is sad.	.470**
Response to Stimuli	**.837****
Item 72- Loud noises startle my child.	.723**
Item 73- Loud places do not overwhelm my child.	.558**
Item 77- My child startles easily.	.763**
Attention to Detail	**.758****
Item 22- My child notices when small things have change.	.458**
Item 21- My child remembers small details.	.645**
Item 43- My child notices detail others might miss.	.696**
Emotional Response	**.762****
Item 47- My child becomes upset when they don’t feel understood.	.472**
Item 52- When something doesn’t come easily to my child, they can become upset.	.529**
Item 59- My child becomes emotionally upset when hungry.	.803**

Scale or Item	Person Correlation (*r*)
Item 71- My child becomes upset when someone raises their voice.	.587**

Note. **Correlation is significant at the 0.01 level (2-tailed).

Implications

The researcher identified a four-factor, 15-item model for assessing sensitivity in preschool-age children. Due to the limitations present in the model (i.e., low interfactor correlations and lower-than-expected internal consistency reliability and variance explained), the researcher concluded that while SPS is identifiable for caregivers of preschool age children, the current model lacked integrity to identify the trait across diverse populations. Based on the preliminary results of the current investigation, the researcher will present possible implications for clinicians, caregivers, and researchers. The researcher encourages users of the HSPS to use the scale as a tool, with caution as more research is needed to confirm the model found.

Implications for Clinicians

Clinicians can use the scale to identify general traits of SPS including *Empathy*, *Response to Stimuli*, *Attention to Detail*, and *Emotional Response*. Based on the top 20% of the sample, the researcher determined cutoff scores for both the HSPS total score and subscales. The following are the cutoff scores: (a) HSPS total score cutoff is 61 or higher, (b) *Empathy* is 23 or higher, (c) *Response to Stimuli* is 11 or higher, (d) *Attention to Detail* is 13 or higher, and (e) *Emotional Response* is 17 or higher. Clinicians can use the HSPS to identify characteristics of SPS and then provide psychoeducation to empower the caregiver and provide the child with the tools to normalize behaviors and cope with the stronger neurological responses to their environment. Specifically, within session, a clinician can use play therapy skills such as reflection of feeling and reflection of content to assist the child in recognizing experienced feelings that may impede their ability to self-regulate. By labeling the behavior, the clinician empowers the child to recognize and label their experienced feelings. Furthermore, when labeling the feelings, the clinician must provide complete acceptance of the child's experiences by being fully present and honoring the child's experiences. If a child is not ready to express feelings themselves but is allowing feelings to be expressed in their play, the therapist can reflect feelings experienced by the child in the metaphor to create safety and distance (Kottman & Meany-Walen, 2018). With time and through perceived safety within the therapeutic relationship, the child can may begin to recognize emotions within themselves. Considering differential diagnoses, clinicians may misdiagnose children's mental health challenges due to numerous shared symptomologies across several childhood disorders (e.g., anxiety, and autism spectrum disorder [ASD]; Aron, 2015; Smith, Sriken, & Erford, 2019). After the researcher assessed Spearman rho correlations and found small to moderate effect sizes between both total and subscales, the researcher concluded that SPS is a trait independent of both anxiety and autism. Furthermore, due to similarities, as evident by the statistical significance (ps = .05, .01) with small to moderate effect sizes, (*rhos* = .230 to .432), clinicians must consider the quality of behaviors prior to determining whether an anxiety or autism diagnosis is appropriate, or if the observed behavior is simply a response secondary to an environment with limited understanding of a child's needs (Blair, 2010; Siegel & Bryson, 2019). In response to limited understanding, clinicians can empower caregivers by first using the SPS alongside other assessment tools to assist in differentiating diagnoses. Through this process, the clinician is then better informed as to what may be causing the child's distress, whether the distress is from (a) lack of acceptance and not having enough time to process things, (b) mental health challenges [e.g., autism, anxiety], (c) a combination of having

SPS within a non-responsive environment developing into a mental health challenge, or (d) a combination of SPS and experienced trauma. Based on the clinician's conclusions, the clinician can then educate the caregiver as to the source of the behavior and model responsive behaviors to alleviate the child's distress. Caregivers can then implement the nurturing responses, increasing the child's "felt safety" and decreasing experienced distress (Opiola & Bratton, 2018; Qualls & Purvis, 2020).

Implications for Caregivers

Based on the statistically significant group differences across caregiver demographics, the researcher concluded that caregivers have an abstract understanding of behaviors related to SPS. Furthermore, variables such as race, gender, and education may impact caregivers subjective view of behaviors related to the temperament trait. Research on reported externalized behaviors has shown that a caregiver's awareness of behaviors does not impact the child-caregiver relationship, yet when those behaviors are viewed as problematic, the child-caregiver relationship is negatively impacted (Nixon et al., 2004). Therefore, the caregiver's subjective reality does not have any negative consequences to the child unless, within the subjective reality, the caregiver views the child's behaviors as problematic. If a clinician can utilize the HSPS to identify SPS in the preschool age child, then the clinician can provide psychoeducation and increase caregivers' understanding of their child's behaviors and needs. The increased understanding allows increased acceptance of the child, which allows the child to develop a secure relationship and experience increased emotional health and overall well-being (Guerney, 1964; Landreth & Bratton, 2020; VanFleet, 2013).

Based on the inter-factor correlations, caregiver responses created a pattern wherein caregivers either observed positive or challenging behaviors associated with SPS, not likely both concurrently. Parents tended to score higher on the Factors that housed positive behaviors such as Factor 1 (Empathy) and Factor 3 (Attention to Detail) or score higher on factors that housed challenging behaviors such as Factor 2 (Response to Stimuli) and Factor 4 (Emotional Response). This observed pattern supports the presence of differential susceptibility, a phenomenon wherein children with SPS are more benefited (e.g., Bakermans-Kranenburg & van IJzendoorn, 2011; Kochanska et al., 2011) or harmed (e.g., Caspi et al, 2002, 2003) compared to the general population based on the level of nurturance and acceptance experienced in their environment (Ellis et al., 2011). In other words, those with SPS may benefit more from responsive and nurturing caregivers than the general population. At the same time, children with SPS are proportionally more harmed from an absence of nurturance, showing increased likelihood of anxiety and depression than those without SPS (Aron et al., 2005; Belsky et al., 2009; Ellis et al., 2011; Kibe et al., 2020; Pluess & Belsky, 2013). Overall, both the established literature, related to validated differential susceptibility, and the identified pattern of inter-factor correlations across positive and challenging behaviors highlight the importance of education related to SPS to increase caregivers' understanding, potentially resulting in a child's increased "felt safety" (Qualls & Purvis; Siegel & Bryson, 2019) and emotional health (Guerney, 1964; Landreth & Bratton, 2020; VanFleet, 2013).

Specifically, caregivers can support their child with SPS by helping them to identify feelings first in themselves and then in their child. Landreth (2012) stated that one must identify a feeling before being able to self-regulate. While children with SPS may sense the feelings felt by their caregiver more so than others their age, they may not understand the feeling or how it originated. This phenomenon is often described by stating that children are great observers but poor interpreters (Kottman & Meany-Walen, 2018; Landreth, 2012). Children with SPS have a higher likelihood of misinterpreting due to an increased ability to observe even subtle stimuli (Aron, 2015). Therefore, when a caregiver can verbalize to their child what they are feeling and why, the caregiver assists their child in understanding the sensations they are experiencing through observation, thus decreasing the child's sense of the unknown and increasing their sense of "felt safety" (Qualls & Purvis, 2020; Siegel & Bryson, 2019). For example, caregivers can teach their child SIFT (sensing, images, feelings, thoughts) to help them become aware of physical sensations, images, feelings, and thoughts (Siegel & Bryson, 2012). For example, a caregiver can assist the child in recognizing a physical sensation such as tiredness by verbally acknowledging that the child may be acting or feeling tired (e.g., "We have been up since 6 am this morning. I wonder if being tired is causing you to feel frustrated. Maybe, it might be good to take a nap first and then try again."). In making these verbal acknowledgements the caregiver provides the child with increased understanding as well as empowers the child to take action to cope with challenging experiences (e.g., reduce physical sensation by taking deep breathes; Siegel & Bryson, 2012). In sharing coping mechanisms with their child, caregivers empower their child to acquire behaviors to reduce stress and increase their ability to cope with overwhelming emotions or experiences. Through this process of nurturance and support, the caregiver can show their child that they are seen, heard, and understood, thus increasing the child's ability to feel connected and empowered (Landreth, 2012).

Implications for Researchers

While the researcher attempted to address many of the gaps present in current literature on identifying SPS in preschool age children (i.e., sampling a diverse population, starting with are large sample of items, creating a measure to identify SPS in children 3-5 years old), additional studies are needed for validation of the HSPS. Furthermore, the HSPS is the first created measure using caregiver report to identify SPS. Previous studies used self-report (e.g., HSCS; Pluess et al., 2018). The researcher utilized caregiver-report based on several known limitations related to preschoolers taking assessments (i.e., cognitive abilities, reading level, etc.). Based on the need to measure SPS through caregiver report, the researcher acknowledges that future research is needed to verify the predictive validity of the HSPS. Moreover, using differential item functioning analysis, the researcher found a myriad of caregiver variables impacting assessment outcomes. Due to the current limitations of the four-factor HSPS model future researchers should consider using the current data to complete another Exploratory Factor Analysis (EFA). Prior to completing the EFA, the researchers should further explore the current data to better understand the relationships found using differential item functioning and analyzing the interfactor correlations of the four-factor model. Specifically, future researchers should assess if moderating variables (e.g., race, gender, and educational level) improve the fit of the model, using structural equation modeling (SEM). Additionally, to assess findings related to the interfactor correlations future researchers could use latent class analysis (LCA) to assess the hypothesis that caregivers primarily identify with either positive or negative aspects of SPS. Finally, once future researchers identify a strong model through a second EFA, subsequent studies should employ a Confirmatory Factor Analysis (CFA) to see how the data fits the model, considering the overall fit of the model (i.e., fit indices) and the individual fit parameters (i.e., parameter estimates and standardized results; Kline, 2016) with a new sample population. Finally, to consider the phenomenon from another's perspectives and further assess predictive validity of the HSPS, researchers should compare results of the HSPS with child observation, clinician identification, and/or assessing other variables such as caregiver's perception of the child's behaviors.

Considering caregivers' perceptions, researchers have found that the child-caregiver relationship is negatively impacted when a caregiver views their child's behaviors as problematic (Nixon et al., 2004). The inclusion of a second Likert scale, asking the caregiver how problematic they perceive each behavior to be, would allow researchers to assess the relationship between caregivers' perceptions of identified SPS behaviors and the HSPS total and subscale scores. Furthermore, data from the problem scale could provide insight into whether perception of the behavior has a relationship with caregivers identifying their child's positive (Factors 1 and 3) or negative (Factors 2 and 4) behaviors.

Multicultural Considerations. One of the biggest limitations of previous research is the homogeneity of sample demographics (Liss et al., 2008; Lionetti et al., 2018; Montoya- Pérez, 2019; Sobocko & Zelenski, 2015). Even when using assessments in other countries, researchers still reported homogeneity of sample as it consisted primarily of undergraduate college students (Ershova et al., 2018; Montoya- Pérez, 2019). While still having a homogeneous sample, researchers for both studies in Russia and Mexico found that items on the Aesthetic Factor did not factor into their scale (Ershova et al., 2018; Montoya- Pérez, 2019). The current researcher found similar findings when running a MANCOVA on the five-factor model of the HSPS. Wherein, 90% of Factor 3, *Noticing and Appreciating Others and Surroundings*, similar to the Aesthetic subscale, was explained by recruitment method. The online recruitment method represented a population with increased privilege and homogeneity (97.9% Female, 96.9% non-Hispanic, and 96.9% Caucasian) compared to the population represented by the data research panel (74.8% Female, 78.8% non-Hispanic, and 55.8% Caucasian). The consistent result across diverse populations underscores the importance to consider how varying demographics influence caregiver-reported behaviors of the child's sensitivity.

Furthermore, considering the principal limitation of homogeneity of sample across studies (i.e., Liss et al., 2008; Lionetti et al., 2018; Montoya- Pérez, 2019; Sobocko & Zelenski, 2015), the researcher hypothesized that due to homogeneity, original measures of SPS may be biased based on variables that indicate privilege (i.e., race, gender, and education). With these systemic concerns in mind, researchers must continue to engage in studies with diverse populations when assessing the efficacy of the HSPS. Finally, to continue to address bias within items in the HSPS, future researchers should use latent class analysis (LCA) to further understand how race, ethnicity, gender, and/or income cluster or intersect in relation to scores on the HSPS. Through continued study, researchers can better identify a modified model for the HSPS that fits the data from a diverse population.

Limitations

Limitations of the current study warrant consideration when interpreting the results. The first limitation included the lack of supporting research, which relates to the psychometrics of instruments researchers will use to determine construct validity (DeVellis, 2017). To mitigate the impact of this limitation, the researcher evaluated validity in several ways, which included following the rigorous steps of an exploratory factor analysis (EFA) as outlined by both DeVellis (2017) and Dimitrov (2012). Additionally, the researcher conducted a CFA on both the PAS and ATEC and conducted a modified CFA of each.

The second possible limitation, necessitating consideration, was the generalizability of the data. While the researcher reached out to numerous preschools in the United States, most of her contacts shared privileges with the researcher (i.e., level of education, race, yearly income); and therefore, a high likelihood existed that the pool of participants may represent a particular subset of the general population. To address the limitation, the researcher attempted to obtain a national sample through Protege and a developed website.

The third limitation was the smaller subsamples within the diverse sample. Specifically, the subsamples across race, except Caucasian, Black or African American, and Asian, were too small to fully understand how intersecting identities may affect response. To address the impact of small subpopulations and reduce the possibility of a Type II error, future researchers should focus on acquiring subsamples large enough to detect even small effect sizes.

The fourth limitation was the amount of variance that the items in the HSPS did not explain. Overall, the variance explained was 41.45%; therefore, room for additional representation through items within the measure still exist. Additionally, when considering the final four-factor HSPS model, the presence of low communalities indicated a large portion of the items' variance was measuring factors not represented in the model, while also understanding that each item was still measuring an aspect of variance across all factors of the HSPS (Pallant, 2020). Through future replication of the study and further understanding how each item impacts the scale as a whole, the researcher hopes to gain the necessary knowledge to increase variance explained within the model.

The fifth limitation, was the presence of a pandemic during data collection, creating a heightened sensitivity for many children. Research should be replicated during a less stressful time to see if new research still detects SPS. Finally, regarding the development of HSPS, items may exist that previous research, the current researcher, or the panel of experts did not consider, thus limiting the total variance among items accounted for sensitivity. Researchers must continue to study how data from varying populations of caregivers of preschoolers fit the current model, strengthening the HSPS and making it increasingly comprehensive and generalizable.

Chapter Five Summary

In Chapter Five, the researcher presented a review of the findings for each question, connecting the outcomes to established research. Using an exploratory factor analysis, the researcher developed and established initial evidence of validity for the Highly Sensitive Preschool Scale (HSPS). Despite initial support for the validity of the HSPS, future research is warranted to further improve and validate the measure. The findings from this study provide implications for caregivers, clinicians, and researchers, and contribute to the growing body of literature on SPS.

APPENDIX A: UNIVERSITY OF CENTRAL FLORIDA INSTITUTIONAL REVIEW BOARD APPROVAL LETTER

UNIVERSITY OF CENTRAL FLORIDA

Institutional Review Board
FWA00000351
IRB00001138, IRB00012110
Office of Research
12201 Research Parkway
Orlando, FL 32826-3246

EXEMPTION DETERMINATION

January 5, 2021

Dear Bethany Russell:

On 1/5/2021, the IRB determined the following submission to be human subjects research that is exempt from regulation:

Type of Review:	Initial Study, Category 2
Title:	HIGHLY SENSITIVE CHILD SCALE FOR PRESCHOOL AGE CHILDREN: DEVELOPMENT, INITIAL VALIDATION OF A NEW INSTRUMENT
Investigator:	Bethany Russell
IRB ID:	STUDY00002562
Funding:	None
Grant ID:	None
Documents Reviewed:	• HRP-251, Category: Faculty Research Approval; • ATEC , Category: Survey / Questionnaire; • Email to Preschool Directors for Phase 2, Category: Recruitment Materials; • Explanation of Research Phase 2, Category: Consent Form; • Explanation of Research Phase 3, Category: Consent Form; • General Demographic Form, Category: Survey / Questionnaire; • HRP-255-FOrm, Category: IRB Protocol; • HSCS-P, Category: Test Instruments; • PAS, Category: Test Instruments; • positive affect well-being, Category: Test Instruments; • Recruitment Email for Phase 2, Category: Recruitment Materials; • Social Media Ad for Phase 2, Category: Recruitment Materials;

This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made, and there are questions about whether these changes affect the exempt status of the human research, please submit a modification request to the IRB. Guidance on submitting Modifications and Administrative Check-in are detailed in the Investigator Manual (HRP-103), which can be found by navigating to the IRB Library within the IRB system. When you have completed your research, please submit a Study Closure request so that IRB records will be accurate.

If you have any questions, please contact the UCF IRB at 407-823-2901 or irb@ucf.edu. Please include your project title and IRB number in all correspondence with this office.

Sincerely,

Racine Jacques, Ph.D.
Designated Reviewer

APPENDIX B: INFORMED CONSENT

EXPLANATION OF RESEARCH

Title of Project: Highly Sensitive Child Scale for Preschool Age Children

Principal Investigator: Bethany Russell

Faculty Supervisor: Dr. Dalena Dillman Taylor

You are being invited to take part in a research study. Whether you take part is up to you.

To tell you a little bit about my study, I am examining your perception of sensitivity in your preschool age child (3-5 years old). Your participation in this investigation is very important and will contribute to a growing body of research regarding identification of sensitivity in preschool age children.

My study includes a general demographic questionnaire and one instrument for a total of about 200 questions. The entire study should take about 25 minutes to complete. At the end of the study, you will be asked to provide an email address from which you will be sent a second survey (about 80 items) to fill out on your child 2 weeks later. When the second link is sent you will be given an ID number to enter the survey the second time. Your email address is solely for sending you the second link and will not be tied to your information to maintain confidentiality. Email addresses will be stored for 12 weeks after taking the initial survey in a password protected folder to which only I, Ms. Russell, has access. Also, considering the importance of early childhood education and literacy, I will be making a $1 donation for each individual participant to organizations that support the development of preschool age children, which participants will have a choice in selecting.

To participate in my study, you need to be at least 18 years old, be a primary caregiver for a preschool age child who exhibits neurotypical development with no current diagnosed developmental delays and be proficient in the English language. Your participation in this study is voluntary, and you may withdraw from the study at any time and without consequence. If you do choose to participate in the study, your responses will be confidential.

You must be 18 years of age or older to take part in this research study.

Study contact for questions about the study or to report a problem: If you have questions, concerns, or complaints please contact Bethany Russell, Doctoral Candidate, Counselor Education and Supervision Program, College of Community Innovation and Education at Bethany.Russell@ucf.edu or Dr. Dalena

Dillman Taylor, Faculty Supervisor, Counselor Education at 407-823-2401 or by email at Dalena.Taylor@ucf.edu.

IRB contact about your rights in this study or to report a complaint: If you have questions about your rights as a research participant, or have concerns about the conduct of this study, please contact Institutional Review Board (IRB), University of Central Florida, Office of Research, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at (407) 823-2901, or email irb@ucf.edu.

APPENDIX C: EMAIL FOR PRESCHOOL DIRECTORS

Hello,

My name is Bethany Russell, a doctoral candidate at the University of Central Florida in the Counselor Education program. I am currently working to complete my dissertation and am reaching out for your help in understanding the differences in children's temperament sensitivity.
As the Director of (NAME OF PRESCHOOL), I am reaching out to see if there is a time we could speak about the study and also give you a chance to ask any questions you might have.

To tell you a little bit about my study, I am examining caregivers' perceptions of sensitivity in their preschool age child. My study includes a general demographic questionnaire and three instruments for a total of about 200 questions. I will be collecting data twice across a two-week period. The entire study should take about 20 minutes to complete each time. Also, considering the importance of early childhood education and literacy, I will be making a $1 donation for each individual participant to organizations that support the development of preschool age children, which participants will have a choice in selecting.

To participate in my study, caregivers need to be at least 18 years old, be a primary caregiver for a preschool age child who exhibits neurotypical development with no current diagnosed developmental delays, and be proficient in the English language.

I sincerely appreciate your consideration with this project. If you have any questions or concerns, or if you would like additional information about my study, please contact me anytime: (573) 808-6801 or Bethany.Russell@ucf.edu.

Sincerely,

Bethany R. Russell, M.A., NCC, CCLS
Registered Mental Health Counselor Intern (FL)
Doctoral Candidate| Counselor Education & Supervision
University of Central Florida
(573) 808-6801
Email: brrussell@knights.ucf.edu

APPENDIX D: EMAIL FOR RECRUITMENT

Hello,

My name is Bethany Russell, a doctoral candidate at the University of Central Florida in the Counselor Education program. I am currently working to complete my dissertation and am reaching out for your help in understanding the differences in children's temperament sensitivity.

To tell you a little bit about my study, I am examining your perception of sensitivity in your preschool age child. My study includes a general demographic questionnaire and three instruments for a total of about 200 questions. The entire study should take about 25 minutes to complete. At the end of the study, you will be asked to provide an email address from which you will be sent a second survey (about 80 items) to fill out on your child 2 weeks later. When the second link is sent you will be given an ID number to enter the survey the second time. Your email address is solely for sending you the second link and will not be tied to your information to maintain confidentiality. Email addresses will be stored for 12 weeks after taking the initial survey in a password protected folder to which only I, Ms. Russell, has access. Also, considering the importance of early childhood education and literacy, I will be making a $1 donation for each individual participant to organizations that support the development of preschool age children, which participants will have a choice in selecting.

To participate in my study, you need to be at least 18 years old, be a primary caregiver for a preschool age child who exhibits neurotypical development with no current diagnosed developmental delays, and be proficient in the English language. Your participation in this study is voluntary, and you may withdraw from the study at any time and without consequence. If you do choose to participate in the study, your responses will be confidential. Please click the link below to go to the survey website (or copy and paste the survey link into your internet browser) to begin the survey.

Survey Link: [XXXX]

Your participation in this investigation is very important and will contribute to a growing body of research regarding identification of sensitivity in preschool age children. I appreciate your time and consideration in completing the survey. It is only through the help of participants like you that researchers can provide information to help guide the development of research regarding children's mental health.

I sincerely appreciate your assistance with this project. If you have any questions or concerns, or if you would like additional information about my study, please contact me anytime: (573) 808-6801 or Bethany.Russell@ucf.edu. Lastly, if you know of other parents or caregivers of preschool age children who may be interested in participating, please forward my contact information. Thank you so much for your willingness to participate!

If you have questions about your rights as a research participant, or have concerns about the conduct of this study, please contact Institutional Review Board (IRB), University of Central Florida, Office of Research, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at (407) 823-2901, or email irb@ucf.edu.

APPENDIX D: GENERAL DEMOGRAPHIC FORM

General Demographic Form

Instructions:

Please provide your responses for each of the following questions. *All responses are confidential*.

1. What is your age in years? ______________________

2. Please indicate your gender:

- ☐ Male
- ☐ Female
- ☐ Non-binary
- ☐ Transgender
- ☐ Other: _______________

3. How do you describe your racial background (select all that apply)?

- ☐ American Indian or Alaska Native
- ☐ Asian
- ☐ Black or African American
- ☐ Bi-racial/Multiracial
- ☐ Caucasian
- ☐ Native Hawaiian or other Pacific Islander
- ☐ Other (please state): ________________________

4. What is your ethnicity?

- ☐ Hispanic or Latino
- ☐ Non-Hispanic or Latino

5. Highest education completed:

- ☐ No degree or diploma
- ☐ High school diploma/ GED
- ☐ Vocational/Technical Certification
- ☐ Associate degree
- ☐ Bachelors degree
- ☐ Masters Degree/Advance Degree
- ☐ Other: ______________________

6. Please indicate your estimated annual household income:

- ☐ < $30,000
- ☐ $31,000 - $60,000
- ☐ $61,000 - $75,000
- ☐ > $75,000

7. Please indicate if you live in a rural or urban area:

- ☐ Rural (low population areas)
- ☐ Urban (area in or surrounding a city)

8. Please indicate your employment status:

- ☐ Part-time
- ☐ Unemployed
- ☐ Full-time

9. Please indicate your geographic region in the United States:

- ☐ United States
- ☐ Other __________

10. Please indicate your geographic region in the country in which you reside:

- ☐ Northeast
- ☐ South
- ☐ Midwest
- ☐ West

The remaining questions pertain to your child:

11. Please indicate your child's age (years and months): Years ___ Months ___

12. Please indicate your child's gender:

- ☐ Male
- ☐ Other: ________________
- ☐ Female
- ☐ Non-binary

13. How do you describe your child's racial background (select all that apply)?

- ☐ American Indian or Alaska Native
- ☐ Other (please state): __________________________
- ☐ Asian
- ☐ Black or African American
- ☐ Bi-racial/Multiracial
- ☐ Caucasian
- ☐ Native Hawaiian or other Pacific Islan

14. What is your child's ethnicity?

- ☐ Hispanic or Latino
- ☐ Non-Hispanic or Latino

15. Please indicate type of schooling your child is in now:

- ☐ Head Start
- ☐ Homeschooled
- ☐ Montessori
- ☐ Public (Other than Head Start) Part-Time
- ☐ Public (Other than Head Start) Full-Time
- ☐ Private Religious Based Schooling
- ☐ Other _________________

16. Please indicate type of schooling your child was in prior to the pandemic:

- ☐ Homeschooled
- ☐ Montessori
- ☐ Public (Other than Head Start) Part-Time
- ☐ Public (Other than Head Start) Full-Time
- ☐ Private Religious Based Schooling
- ☐ Other _________________

17. Please indicate your child's birth order:

- ☐ Only child
- ☐ Youngest
- ☐ Middle Child
- ☐ Oldest Child

18. Please indicate on average the number of hours your child spends in front of a screen each day:

- ☐ less than 1 hour
- ☐ 1-2 hour
- ☐ 2-4 hours
- ☐ 4-6 hours
- ☐ more than 6 hours

19. Please indicate on average the number of hours your child spends in front of a screen for school each day:

- ☐ None
- ☐ less than 1 hour
- ☐ 1-2 hours
- ☐ 2-4 hours
- ☐ 4-6 hours

20. Please indicate your child's current height: ________

21. Please indicate your child's current weight: ________

22. On a scale of 1 to 5 (1 being never and 5 being always), how often do you understand why your child is behaving the way they are?

1 2 3 4 5

23. On a scale of 1 to 5 (1 being never and 5 being always), how often do you view your child's behaviors as problematic?

1 2 3 4 5

24. Please select which of the following early childhood organizations you would like the researcher to donate your $1 to?

- ☐ National Head Start Association
- ☐ Dolly Parton's Imagination Library
- ☐ UNICEF

Thank you! Please continue to the next page

APPENDIX E: INITIAL 80-ITEM HSPS

Highly Sensitive Preschool Scale

Directions: Choose a response for how much you agree with each of the following statements pertaining to your child.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. It takes time for my child to make decisions.	1	2	3	4	5
2. My child takes time to answer questions when offered options.	1	2	3	4	5
3. My child is able to quickly make a choice.	1	2	3	4	5
4. My child isn't emotionally affected when another child is physically hurt.	1	2	3	4	5
5. My child notices when their friend is upset.	1	2	3	4	5
6. My child feels sad when seeing someone else who is sad.	1	2	3	4	5
7. If my child knows I am having a hard time, my child tries to comfort me.	1	2	3	4	5
8. My child notices when I am having a hard day.	1	2	3	4	5
9. My child doesn't easily show emotion.	1	2	3	4	5
10. My child likes to help other kids.	1	2	3	4	5
11. It is common for my child to want to help others.	1	2	3	4	5

12. My child doesn't understand humor.	1	2	3	4	5
13. My child moves on quickly after being upset.	1	2	3	4	5
14. My child asks a lot of questions.	1	2	3	4	5
15. Understanding how things work is important to my child (e.g., a computer, mechanical toy, or puzzle).	1	2	3	4	5
16. My child easily stays on task in a calm environment.	1	2	3	4	5
17. My child easily stays on task in a busy or loud environment.	1	2	3	4	5
18. My child is easily bored.	1	2	3	4	5
19. It takes a lot of time for my child to make a choice.	1	2	3	4	5
20. Change in routine doesn't impact my child.	1	2	3	4	5
21. My child remembers small details.	1	2	3	4	5
22. My child notices when small things have changed (e.g., person's appearance, item has been moved).	1	2	3	4	5
23. My child has big emotions.	1	2	3	4	5
24. My child doesn't recognize feelings in others.	1	2	3	4	5
25. My child expects detailed answers to questions.	1	2	3	4	5
26. After being with people, my child enjoys spending time alone.	1	2	3	4	5

27. My child has a heightened pain response.	1	2	3	4	5
28. My child does not have difficulty when changes happen.	1	2	3	4	5
29. It is hard for my child to sleep after a busy day.	1	2	3	4	5
30. After a busy day, my child is irritable.	1	2	3	4	5
31. My child sleeps well through the night.	1	2	3	4	5
32. My child wakes up often in the night.	1	2	3	4	5
33. My child has frequent night terrors.	1	2	3	4	5
34. My child often reports having stomach pains.	1	2	3	4	5
35. My child rarely cries.	1	2	3	4	5
36. My child doesn't worry.	1	2	3	4	5
37. My child has trouble getting to sleep after a chaotic day.	1	2	3	4	5
38. My child asks many questions when they are trying to fall asleep.	1	2	3	4	5
39. My child rarely reports being in pain.	1	2	3	4	5
40. My child feels pain more intensely than other kids their age.	1	2	3	4	5s
41. My child is bothered by tags in their clothes.	1	2	3	4	5
42. My child verbalizes when things are pretty.	1	2	3	4	5

43. My child notices details others might miss.	1	2	3	4	5
44. My child does not have a preference in textures of clothing.	1	2	3	4	5
45. My child has a high pain threshold.	1	2	3	4	5
46. My child isn't affected when making a mistake.	1	2	3	4	5
47. My child becomes upset when they don't feel understood.	1	2	3	4	5
48. My child is a perfectionist.	1	2	3	4	5
49. When something doesn't come easily to my child, they quit.	1	2	3	4	5
50. When a character in a movie is sad, my child also becomes sad.	1	2	3	4	5
51. My child needs to be reminded to be kind to their friends.	1	2	3	4	5
52. When something doesn't come easily to my child, they can become upset.	1	2	3	4	5
53. My child worries about disappointing others.	1	2	3	4	5
54. My child enjoys trying new things.	1	2	3	4	5
55. My child takes time to observe before entering new situations.	1	2	3	4	5

56. My child doesn't get upset often.	1	2	3	4	5
57. My child becomes overwhelmed in a chaotic environment.	1	2	3	4	5
58. My child's mood is not affected when others are upset.	1	2	3	4	5
59. My child becomes emotionally upset when hungry.	1	2	3	4	5
60. My child becomes excited for new opportunities (e.g., starting school).	1	2	3	4	5
61. My child has difficulty performing in front of others.	1	2	3	4	5
62. Movies with violence do not upset up child.	1	2	3	4	5
63. When a character on tv is sad, my child looks sad.	1	2	3	4	5
64. My child enjoys performing in front of others.	1	2	3	4	5
65. My child has difficulty completing a task under pressure.	1	2	3	4	5
66. Bright lights don't bother my child.	1	2	3	4	5
67. My child notices when I style my hair differently.	1	2	3	4	5
68. My child notices when I am emotional.	1	2	3	4	5
69. My child prefers to have things explained first.	1	2	3	4	5
70. My child wants to do things right.	1	2	3	4	5

71. My child becomes upset when someone raises their voice.	1	2	3	4	5
72. Loud noises startle my child.	1	2	3	4	5
73. Loud places do not overwhelm my child.	1	2	3	4	5
74. My child notices when something smells bad.	1	2	3	4	5
75. My child is emotional when they are hungry.	1	2	3	4	5
76. My child notices new smells.	1	2	3	4	5
77. My child startles easily.	1	2	3	4	5
78. My child enjoys creating things using art supplies.	1	2	3	4	5
79. My child enjoys music.	1	2	3	4	5
80. My child doesn’t notice when things are pretty.	1	2	3	4	5

APPENDIX F: FINAL FOUR FACTOR HSPS

Highly Sensitive Preschool Scale (HSPS)

Approximately 15-30% of children (Arron & Jagiellowicz, 2012; Lionetti et al., 2018; Pluess et al., 2018) have an innate temperament called sensory processing sensitivity (SPS; Aron & Aron, 1997; Aron, 2015; Pluess et al., 2018). Individuals with SPS, regardless of where they are on the continuum of introversion/extroversion, are born with a heighten sensitivity to their surroundings, compared to the general population (Aron, 2015; Aron et al., 2012; Pluess et al., 2018). The experienced heightened sensitivity includes stronger neurological and emotional responses to surrounding and experienced stimuli (Pluess et al., 2018).

Furthermore, researchers have found that development in preschool age children (3-5 years old) is both critical and formative wherein emotional wellness predicts mental health wellness throughout the child's life (Rapee, Kennedy, Ingram, Edwards, & Sweeney, 2005). Considering the developmental needs of preschool age children with SPS, the researcher created an instrument to identify the presence of the temperament trait based on caregiver report within the general population of children ages 3-5 years. **While the research results were tentative and strengthening of the HSPS model is needed, the current four-factor, 15-item, model is below.**

Directions: Below is a list of items that describe children. Choose a response for how much you agree that the behavior describes your child. Please circle the **5** if you **strongly agree**, **4** if you **agree**, **3** if you are **neutral**, **2** if you **disagree**, and **1** if you **strongly agree**.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. My child notices when their friend is upset.	1	2	3	4	5
2. My child feels sad when seeing someone else who is sad.	1	2	3	4	5

3. If my child knows I am having a hard time, my child tries to comfort me.	1	2	3	4	5
4. My child notices when I am having a hard day.	1	2	3	4	5
5. My child remembers small details.	1	2	3	4	5
6. My child notices when small things have changed (e.g., person's appearance, item has been moved).	1	2	3	4	5
7. My child notices details others might miss.	1	2	3	4	5
8. My child becomes upset when they don't feel understood.	1	2	3	4	5
9. When something doesn't come easily to my child, they can become upset.	1	2	3	4	5
10. My child becomes emotionally upset when hungry.	1	2	3	4	5
11. My child notices when I am emotional.	1	2	3	4	5
12. My child becomes upset when someone raises their voice.	1	2	3	4	5
13. Loud noises startle my child.	1	2	3	4	5
14. Loud places do not overwhelm my child.	1	2	3	4	5
15. My child startles easily.	1	2	3	4	5

Note. Grey highlighted item indicates a reverse scored item.

Initial Theoretical Underpinnings of Developed Items

Depth of Processing (Items [None in the Four-Factor Model]): Encompasses, but is not limited to, the depth of questions asked by a child, presence of a clever sense of humor, and difficulty in making decisions (Aron, 2015; Jagiellowicz, 2012).

Overstimulated (Items 6-7): Encompasses a child taking in and noticing *all* subtle or minute aspects of their surroundings, leading to overstimulation and exhaustion. Additionally, they experience ease overstimulation in response to both internal and external demands (Smolewska, McCabe, & Woody, 2006; Sobocko & Zelenski, 2015). A child that is easily overstimulated has extreme responses to pain or change, frequently experiences meltdowns, and has difficulty falling and staying asleep (2015). Additionally, a child experiences unpleasant arousal to external stimuli such as loud noises (Smolewska, McCabe, & Woody, 2006; Sobocko & Zelenski, 2015).

Heightened Emotions (Items 13 & 15): When a child feels deeply, which leads a child to cry often (Aron, 2015). Additionally, children are perfectionist or respond adversely to doing anything incorrectly (Aron, 2015).

Emotional Awareness (Items 1-5, 12, & 15): Encompasses noticing when others are in distress (Aron, 2015). Children not only recognize emotions within themselves but also of others. Individuals with SPS have a heightened awareness of when loved ones are happy or sad, as well as, when strangers are happy (Acevedo et al., 2014).

Sensitive to Subtle Stimuli (Items 8-11, 14): Ability to notice slight changes in appearance of people, places, and things, being aware of communication styles including a glare, sigh, or tone of voice, and to notice slight changes in smells (i.e., a child experiences unpleasant arousal to external stimuli such as loud noises; Aron, 2020; Smolewska, McCabe, & Woody, 2006; Sobocko & Zelenski, 2015). Children with this sensitivity are more in tuned to what adults (i.e., caregivers, coaches, teachers) want or expect from them, increasing their success in various activities (Aron, 2015). Finally, children have an openness for, appreciation for, and/or the ability to be moved/inspired by the arts and other positive stimuli (Smolewska, McCabe, & Woody, 2006; Sobocko & Zelenski, 2015).

Final Four Factors

Empathy, 17.9% of variance explained, (Items 1-5): Considering *Empathy*, no other model of high sensitivity had a factor that included items related to empathy, creating a new area of understanding regarding SPS in young children (Aron & Aron, 1997; Evans & Rothbart, 2008; Montoya-Pérez et al., 2019; Smith et al., 2019; Smolewska et al., 2006; Sobocko & Zelenski, 2015). While items pertaining to empathy are not included in other developed instruments on sensitivity, empathy is found in the theoretical tenants of SPS (Aron, 2015; Pluess et al., 2018). Furthermore, empathy is a behavior that, within the general population of preschool age children, only begins to develop at age five as egocentrism lessens and children begin to consider others' perspectives (Dillman Taylor, 2016; Erikson, 1963).

Response to Stimuli, 11.85% of variance explained, (Items 6-8): The presence of overstimulation due to environmental stimuli has been found across adult and now child scales of sensitivity (e.g., *Low Sensitivity Threshold,* Smolewska et al., 2006; Sobocko & Zelenski, 2015; *Response to Stimuli,* HSPS). The presence of overstimulation and emotionality across measures for adults and young children supports the assumption that SPS is an innate trait and not an acquired trait or developed dysfunction. Considering SPS as an innate trait heightens the importance of identifying the trait early in life (e.g., preschool age). Finally, items in this factor include theoretical tenants from both *Overstimulation* and *Sensitive to Subtle Stimuli*.

Attention to Detail, 6.6% of variance explained, (Items 9-11): Currently there is not a subscale for attention to detail with adults but items concerning attention to detail can be found on the sensitivity test for children ages 8-18 (i.e., Highly Sensitive Child scale [HSC], Pluess et al., 2018). Items in this factor include theoretical tenants of SPS including *Sensitive to Subtle Stimuli*.

Emotional Response, 5.1% of variance explained, (Items 12-15): The presence of emotionality has been identified across previous adult measures of sensitivity and now child measures of sensitivity (e.g., *Negative Emotionality*, Smolewska et al., 2006; Sobocko & Zelenski, 2015; *Emotional Responses*, HSPS). Furthermore, items in this factor include several theoretical tenants of SPS including *Sensitive to Subtle Stimuli*, *Emotional Awareness*, and *Heightened Emotions*.

APPENDIX G: PRESCHOOL ANXIETY ASSESSMENT-PARENT REPORT (PAS)

PRESCHOOL ANXIETY SCALE
(Parent Report)

Your Name: ______________ **Date:** ______________

Your Child's Name: ______________

Below is a list of items that describe children. For each item please circle the response that best describes your child. Please circle the **4** if the item is **very often true, 3** if the item is **quite often true, 2** if the item is **sometimes true, 1** if the item is **seldom true** or if it is **not true at all** circle the **0**. Please answer all the items as well as you can, even if some do not seem to apply to your child.

		Not True at All	Seldom True	Sometimes True	Quite Often True	Very Often True
1	Has difficulty stopping him/herself from worrying…………………	0	1	2	3	4
2	Worries that he/she will do something to look stupid in front of other people……………………………………………………….…	0	1	2	3	4
3	Keeps checking that he/she has done things right (e.g., that he/she closed a door, turned off a tap)………………..	0	1	2	3	4
4	Is tense, restless or irritable due to worrying……………….…….	0	1	2	3	4
5	Is scared to ask an adult for help (e.g., a preschool or school teacher)……………………………………………………………...	0	1	2	3	4
6	Is reluctant to go to sleep without you or to sleep away from home……………………………………………………………….	0	1	2	3	4
7	Is scared of heights (high places)…………………………………….	0	1	2	3	4
8	Has trouble sleeping due to worrying………………………………	0	1	2	3	4
9	Washes his/her hands over and over many times each day…….	0	1	2	3	4
10	Is afraid of crowded or closed-in places……………………………..	0	1	2	3	4
11	Is afraid of meeting or talking to unfamiliar people…………………	0	1	2	3	4
12	Worries that something bad will happen to his/her parents……….	0	1	2	3	4
13	Is scared of thunder storms……………………….…………………..	0	1	2	3	4
14	Spends a large part of each day worrying about various things.….	0	1	2	3	4
15	Is afraid of talking in front of the class (preschool group) e.g., show and tell……………………………..…………………….	0	1	2	3	4
16	Worries that something bad might happen to him/her (e.g., getting lost or kidnapped), so he/she won't be able to see you again………………………………………………………………..	0	1	2	3	4
17	Is nervous of going swimming………………………………………...	0	1	2	3	4

		Not True at All	Seldom True	Sometimes True	Quite Often True	Very Often True
18	Has to have things in exactly the right order or position to stop bad things from happening……………………………………………	0	1	2	3	4
19	Worries that he/she will do something embarrassing in front of other people……………………………………………………………	0	1	2	3	4
20	Is afraid of insects and/or spiders…………………………………	0	1	2	3	4
21	Has bad or silly thoughts or images that keep coming back over and over…………………………………………………………………	0	1	2	3	4
22	Becomes distressed about your leaving him/her at preschool/school or with a babysitter………………………………...	0	1	2	3	4
23	Is afraid to go up to group of children and join their activities……..	0	1	2	3	4
24	Is frightened of dogs……………………………………………………	0	1	2	3	4
25	Has nightmares about being apart from you………………………...	0	1	2	3	4
26	Is afraid of the dark……………………………………………………	0	1	2	3	4
27	Has to keep thinking special thoughts (e.g., numbers or words) to stop bad things from happening………………………………………	0	1	2	3	4
28	Asks for reassurance when it doesn't seem necessary……………	0	1	2	3	4
29	Has **your child ever experienced anything really bad or traumatic** (e.g., severe accident, death of a family member/friend, assault, robbery, disaster)…………………………	**YES**	**NO**			

Please briefly describe the event that your child experienced……
____
____
____
____
____

If you answered **NO** to **question 29,** please **do not** answer questions 30-34**. If you answered YES, please DO** answer the following questions**.**

Do the following statements describe your child's behaviour since the event?

		Not True at All	Seldom True	Sometimes True	Quite Often True	Very Often True
30	Has bad dreams or nightmares about the event……………………	0	1	2	3	4
31	Remembers the event and becomes distressed……………………	0	1	2	3	4
32	Becomes distressed when reminded of the event…………………	0	1	2	3	4
33	Suddenly behaves as if he/she is reliving the bad experience……	0	1	2	3	4
34	Shows bodily signs of fear (e.g., sweating, shaking or racing heart) when reminded of the event …………………………………	0	1	2	3	4

APPENDIX H: AUTISM TREATMENT EVALUATION CHECKLIST (ATEC)

ARI/Form
ATEC-1/11-99

Autism Treatment Evaluation Checklist (ATEC)

Bernard Rimland, Ph.D. and Stephen M. Edelson, Ph.D.
Autism Research Institute
4182 Adams Avenue, San Diego, CA 92116
fax: (619) 563-6840; www.autism.com/ari

Project/Purpose:				
Scores: I	II	III	IV	Total

This form is intended to measure the effects of treatment. Free scoring of this form is available on the Internet at: www.autism.com/atec

Name of Child ____________________ ____________________ ☐ Male Age __________
Last First ☐ Female Date of Birth __________
Form completed by: ____________________ Relationship: ______________ Today's Date __________

Please circle the letters to indicate how true each phrase is:

I. Speech/Language/Communication: ***[N] Not true [S] Somewhat true [V] Very true***

N S V 1. Knows own name
N S V 2. Responds to 'No' or 'Stop'
N S V 3. Can follow some commands
N S V 4. Can use one word at a time (No!, Eat, Water, etc.)
N S V 5. Can use 2 words at a time (Don't want, Go home)
N S V 6. Can use 3 words at a time (Want more milk)
N S V 7. Knows 10 or more words
N S V 8. Can use sentences with 4 or more words
N S V 9. Explains what he/she wants
N S V 10. Asks meaningful questions
N S V 11. Speech tends to be meaningful/ relevant
N S V 12. Often uses several successive sentences
N S V 13. Carries on fairly good conversation
N S V 14. Has normal ability to communicate for his/her age

II. Sociability: ***[N] Not descriptive [S] Somewhat descriptive [V] Very descriptive***

N S V 1. Seems to be in a shell – you cannot reach him/her
N S V 2. Ignores other people
N S V 3. Pays little or no attention when addressed
N S V 4. Uncooperative and resistant
N S V 5. No eye contact
N S V 6. Prefers to be left alone
N S V 7. Shows no affection
N S V 8. Fails to greet parents
N S V 9. Avoids contact with others
N S V 10. Does not imitate
N S V 11. Dislikes being held/cuddled
N S V 12. Does not share or show
N S V 13. Does not wave 'bye bye'
N S V 14. Disagreeable/not compliant
N S V 15. Temper tantrums
N S V 16. Lacks friends/companions
N S V 17. Rarely smiles
N S V 18. Insensitive to other's feelings
N S V 19. Indifferent to being liked
N S V 20. Indifferent if parent(s) leave

III. Sensory/Cognitive Awareness: ***[N] Not descriptive [S] Somewhat descriptive [V] Very descriptive***

N S V, 1. Responds to own name
N S V 2. Responds to praise
N S V 3. Looks at people and animals
N S V 4. Looks at pictures (and T.V.)
N S V 5. Does drawing, coloring, art
N S V 6. Plays with toys appropriately
N S V 7. Appropriate facial expression
N S V 8. Understands stories on T.V.
N S V 9. Understands explanations
N S V 10. Aware of environment
N S V 11. Aware of danger
N S V 12. Shows imagination
N S V 13. Initiates activities
N S V 14. Dresses self
N S V 15. Curious, interested
N S V 16. Venturesome - explores
N S V 17. "Tuned in" — Not spacey
N S V 18. Looks where others are looking

IV. Health/Physical/Behavior: ***<u>Use this code:</u> [N] Not a Problem [MI] Minor Problem [MO] Moderate Problem [S] Serious Problem***

N MI MO S 1. Bed-wetting
N MI MO S 2. Wets pants/diapers
N MI MO S 3. Soils pants/diapers
N MI MO S 4. Diarrhea
N MI MO S 5. Constipation
N MI MO S 6. Sleep problems
N MI MO S 7. Eats too much/too little
N MI MO S 8. Extremely limited diet
N MI MO S 9. Hyperactive
N MI MO S 10. Lethargic
N MI MO S 11. Hits or injures self
N MI MO S 12. Hits or injures others
N MI MO S 13. Destructive
N MI MO S 14. Sound-sensitive
N MI MO S 15. Anxious/fearful
N MI MO S 16. Unhappy/crying
N MI MO S 17. Seizures
N MI MO S 18. Obsessive speech
N MI MO S 19. Rigid routines
N MI MO S 20. Shouts or screams
N MI MO S 21. Demands sameness
N MI MO S 22. Often agitated
N MI MO S 23. Not sensitive to pain
N MI MO S 24. "Hooked" or fixated on certain objects/topics
N MI MO S 25. Repetitive movements (stimming, rocking, etc.)

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